MITSUBISHI ELECTRIC

Mitsubishi Programmable Controller

MELSEC **Q** series

FL-net (OPCN-2) Interface Module
User's Manual

-QJ71FL71-T-F01
-QJ71FL71-B5-F01
-QJ71FL71-B2-F01
-QJ71FL71-T
-QJ71FL71-B5
-QJ71FL71-B2
-GX Configurator-FL (SW0D5C-QFLU-E)
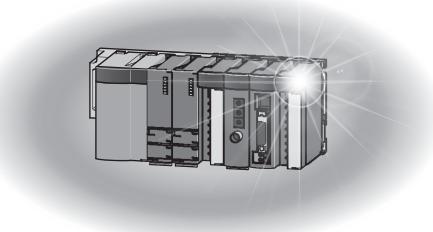
• SAFETY PRECAUTIONS •

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product only. For the safety instructions of the programmable controller system, please read the user's manual for the CPU module to use.
In this manual, the safety precautions are ranked as "⚠ WARNING" and "⚠ CAUTION".

⚠ WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Note that the ⚠ CAUTION level may lead to serious consequence according to the circumstances.
Always follow the instructions of both levels because they are important to personal safety.

Please store this manual in a safe place and make it accessible when required. Always forward it to the end user.

[DESIGN PRECAUTIONS]

⚠ WARNING

- Refer to Section 6.2.7 of this manual for information about the operation of each node when the cyclic transmission generates a communication error when using FL-net (OPCN-2). The wrong output or erroneous operation could result in an accident.
- Never write data to the "system area" of the buffer memory for the intelligent function unit buffer memory. In addition, never output (set to on) the "use prohibited" signal during an output signal from the programmable controller CPU to the intelligent function unit. Writing data to the "system area" or output of a "use prohibited" signal could result in the malfunction of the sequence system.

⚠ CAUTION

- Do not bundle the control wires and communication cables with the main circuit or power wires, or install them close to each other.
  They should be installed at least 100mm(3.94 in.) away from each other.
  Failure to do so may generate noise that may cause malfunctions.

[MOUNTING PRECAUTIONS]

⚠ CAUTION

- Use the programmable controller in the operating environment that meets the general specifications of this manual.
  Using the programmable controller in any other operating environments may cause electric shocks, fires or malfunctions, or may damage or degrade the product.
- While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely mount the module with the fixing hole as a supporting point.
  If the module is not installed properly, it may cause the module to malfunction, fail or fall off.
  Secure the module with screws especially when it is used in an environment where constant vibrations may occur.
- Be sure to tighten the screws within the specified torque range.
  If the screws are loose, it may cause the module to short-circuit, malfunction or fall off.
  If the screws are tightened excessively, it may damage the screws and cause the module to short-circuit, malfunction or fall off.
- Before mounting or dismounting the module, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to do so may damage the product.
- Do not directly touch the conducting parts and electronic parts of the module. This may cause the module to malfunction or fail.

[WIRING PRECAUTIONS]

⚠ CAUTION

- When wiring the connectors for external cables connection, crimp or clamp the wires with a tool specified by the manufacture or solder them. An incomplete connection could cause malfunctions.
- Do not connect AUI cables when the programmable controllers on the station where the module is mounted and the FL-net (OPCN-2) system are powered ON.
- Install the connector to the module securely.
- Place the communication and power cables to be connected to the module in a duct or fasten them using a clamp. If not, dangling cables may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunctions due to poor cable contact.
- Always tighten the screws within the specified torque range.
  If the screws are loose, shorting or malfunctioning could result. If the screws are too tight, they could break off, fall into the unit and cause shorting or malfunctioning.
- When disconnecting a communication or power cable from the module, do not pull the cable part by hand. When disconnecting a cable with a connector, hold the connector connected to the module by hand and pull it out. When disconnecting a cable connected to a terminal block, loosen the screws on the terminal block first before removing the cable. Failure to do so may cause a malfunction or damage to the module and/or cables.

[WIRING PRECAUTIONS]

⚠ CAUTION

- Be careful not to let foreign matter such as dust and wire chips get inside the module. They may cause a fire, mechanical breakdown or malfunction.
- The top surface of the module is covered with a protective film to prevent foreign matter such as wire chips from entering the module during wiring work. Do not remove this film until all the wiring work is complete. Before operating the system, be sure to remove the film to release heat.

[STARTUP/MAINTENANCE PRECAUTIONS]

⚠ CAUTION

- Never disassemble or modify the module. This may cause breakdowns, malfunctions, injuries or fire.
- Before mounting or dismounting the module, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to do so may damage the module or result in malfunctions
- Do not install/remove the module to/from the base unit more than 50 times after the first use of the product. (IEC 61131-2 compliant)
  Failure to do so may cause malfunction.
- Do not touch the terminals while the power is on. Doing so may cause malfunctions.
- Before cleaning the module or retightening the terminal screws and module fixing screws, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to completely shut off all phases of the external power supply may cause module breakdowns and malfunctions. If the screws are loose, it may cause the module to short-circuit, malfunction or fall off. If the screws are tightened excessively, it may damage the screws and cause the module to short circuit, malfunction or fall off.
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
  Failure to do so may cause a failure or malfunctions of the module.

[DISPOSAL PRECAUTIONS]

⚠ CAUTION

- When disposing of this product, treat it as industrial waste.

• CONDITIONS OF USE FOR THE PRODUCT •

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;

    i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and

    ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

REVISIONS

Print Date	＊ Manual Number	Revision
Aug., 2002	SH (NA)-080350E-A	First edition
Feb., 2003	SH (NA)-080350E-B	**Modifications** SAFETY PRECAUTIONS, About Manuals, Section 3.1.1, Section 6.4.4, INDEX
Jul., 2003	SH (NA)-080350E-C	**Modifications** This Manual's Use and Structure, About the Generic Terms and Abbreviations, Product Composition, Chapter 1, Section 1.2, Section 3.1, 3.1.1, 3.1.2, 3.2.2, 3.2.5, 3.2.6, 3.5, 3.6, Section 4.2, Section 5.1.1, Section 6.3.2, 6.4.3, 6.4.5, 6.4.6, 6.4.7, 6.4.8, 6.4.9, 6.4.10, 6.5, 6.5.3, 6.5.4, Section 7.1, Section 8.4, 8.5.1, 8.5.2, 8.6, Appendix 1, Appendix 4.4, Appendix 7.3, 7.4, Appendix 10, INDEX **Chapter/section No. change** From Section 5.1.2 to Section 5.1.3 **Addition** Section 5.1.2 **Model addition** QJ71FL71-T-F01, QJ71FL71-B5-F01 **Model deletion** QJ71FL71-F01
Jun., 2004	SH (NA)-080350E-D	**Modifications** SAFETY PRECAUTIONS, Section 1.2, Section 3.1.1, 3.2.5, 3.5, Section 6.2.7, 6.4.6, 6.4.8, 6.4.10, 6.5, 6.5.4 **Chapter/section No. change** From Appendix 10 to Appendix 11 **Addition** Appendix 10
Jan., 2006	SH (NA)-080350E-E	**Modifications** SAFETY PRECAUTIONS, Section 1.2, 1.4, Section 3.1.2, 3.2, 3.5, Chapter 4, Section 5.1, Section 6.1.4, 6.2, 6.4, 6.5, Section 8.2 **Chapter/section No. change** From Section 8.6 to Section 8.7, From Appendix 11 to Appendix 12 **Addition** Compliance with the EMC and Low Voltage Directives, Section 8.6, Appendix 11
Feb., 2006	SH (NA)-080350E-F	**Modifications** Section 3.1.1, 3.2.6, Section 6.4.6, 6.4.8, 6.4.10, 6.5.4

Print Date	✳ Manual Number	Revision
Jan., 2008	SH (NA)-080350E-G	Modifications SAFETY PRECAUTIONS, About the Generic Terms and Abbreviations, Section 1.2, 1.3, Section 3.1.1, 3.1.2, 3.2.2, to 3.2.6, 3.4, to 3.6, Section 4.2, Section 5.1, Section 6.1.2, 6.3.2, 6.2.7, 6.2.8, 6.3.2, 6.4.3, 6.4.4, 6.5.2, 6.5.4, Section 8.1, 8.3, 8.4, 8.5.1, 8.6, Appendix 2.3, Appendix 3.8, Appendix 4.3, Appendix 5.1, Appendix 6.1, 6.3, Appendix 7.3, 7.4, Appendix 9, Appendix 12
May., 2008	SH (NA)-080350E-H	Change of a term "PLC" was changed to "programmable controller". Modifications SAFETY PRECAUTIONS, Compliance with the EMC and low voltage directives, About the Generic Terms and Abbreviations, Section 2, Section 3.1.1, 3.2.2 to 3.2.6, 3.5, Section 4.2, Section 5.1.1 to 5.1.3, Section 6.1.1, 6.1.3, 6.2.1, 6.2.6 to 6.2.8, 6.3, 6.4.1, 6.4.3, 6.4.5 to 6.4.10, 6.5 Section 7.2, Section 8.3 to 8.5, Appendix 2.2 to 2.5, Appendix 3.1, 3.5, 3.6, 3.8, Appendix 4.1, 4.2, 4.4, 4.6, Appendix 5.1, 5.2, Appendix 6.2, 6.3, Appendix 7, Appendix 9, Appendix 10, Appendix 12
Jan., 2009	SH (NA)-080350E-I	Model addition QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2 Change of a term The Manual's Use and Structure, About the Generic Terms and Abbreviations, Product Composition, Chapter 1, Section 1.2, Section 3.1.1, 3.1.2, 3.2.2, 3.2.5, 3.2.6, 3.5, 3.6, Section 5.1.1 to 5.1.3, Section 6.2.8, 6.3.2, 6.4.3, 6.5, Section 8.4, 8.7, Appendix 1, Appendix 6.1, Appendix 13 Chapter/section No. change Appendix 3 to 12 → Appendix 4 to 13 Addition Appendix 2
Dec., 2009	SH (NA)-080350E-J	Change of a term Section 1.2, 3.2.5, 6.2.8, 6.3.2, 6.4.10, 6.5.1, 6.5.2, 6.5.3, 6.5.4, 8.4, Appendix 13 Addition CONDITIONS OF USE FOR THE PRODUCT
Jul., 2012	SH (NA)-080350E-K	Change of a term COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES, About the Generic Terms and Abbreviations, Section 3.1.1, 3.1.2, 3.2.2, 3.5, 6.2.7, 6.4.4, Appendix 6.1, 7.2, 7.3, 13, WARRANTY

Japanese Manual Version SH-080349-O

INTRODUCTION

Thank you for purchasing the MELSEC-Q series programmable controller.
Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the Q series programmable controller you have purchased, so as to ensure correct use. Please forward a copy of this manual to the end user.

CONTENTS

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

(1) Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

• QCPU User's Manual (Hardware Design, Maintenance and Inspection)

• Safety Guidelines

(This manual is included with the CPU module or base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

(2) Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the manuals listed under (1).

● How to use this manual

This manual is organized to provide information for specific usage applications for the FL-net module (QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2). Refer to this manual for information on the following topics.

(1) When you want a list of features and utilities . .

    (a) To find out about features and functions
- The features of the FL-net module are provided in Chapter 1.
- The common functions, specifications and other details about FL-net are provided in Chapter 3.

    (b) When you want to know about the parts provided and component parts of the network . . .
- The "Product Composition" at the front of Chapter 1 provides a list of the parts provided in the package at the time of purchase of the FL-net module.
- Section 3.1.2 provides a description of the system components for the FL-net module. The user is responsible for obtaining the parts and materials required that have not been provided with the FL-net module.

(2) When you want to know the necessary procedures before starting the FL-net module. . .

    (a) To find out the start-up procedure
- Section 6.3.1 provides a summary of the procedures required up to operating the FL-net module.

    (b) To find out information about connecting to the FL-net (OPCN-2) network system. . .
- Section 3.1.2 provides information about the equipment required for connecting to the FL-net (OPCN-2) network system.
- Chapter 5 provides the connection methods for connecting to the FL-net (OPCN-2) network system, listed by connected type.

    (c) To find out the necessary procedures before starting the FL-net module. . .
- There are parameter setting screens from GX Developer for using the FL-net module. Section 6.3.2 provides information about the types of parameter setting screens.

    (d) To find out the method for confirming whether or not the FL-net module has failed . . .
- Section 6.3.1(1) provides the self-diagnosis tests for the FL-net module.

    (e) To find out the method for confirming whether or not there is an error in the connection with corresponding equipment . .
- Section 8.2 (3) provides the method for confirming using the "PING" command.

(3) When you want to know about the types of data communication with detailed explanations. . .

(a) To find out about the types of data communications. . .
  • Section 6.2.3 provides information about the types of data communication for the FL-net module.

(b) To find out about the location of detailed explanations about each of the communication methods . . .
  • Section 6.2.7 provides information about cyclic transmissions and areas.
  • Section 6.2.8 provides information about message transmissions.

(4) When you want to know about the program methods for performing communication with the FL-net module. . .
  • The beginning of Section 6.5 provides information about the procedures for creating programs.
  • Section 6.5.4 provides sample programs.

(5) When you want to know how to perform inspections and maintenance on the FL-net module and how to remove and replace components. . .

(a) To find out about inspections and maintenance. . .
  • Section 7.1 provides information about inspection and maintenance of the FL-net module.

(b) To find out about the procedure for removing and replacing components. . .
  • Section 7.2 provides the operating procedure when replacing the FL-net module and replacing the CPU.

(6) When you want to know how to confirm an errors and the methods for responding to them. . .

(a) To find the meanings of the error codes . . .
  • Chapter 8 provides the methods for troubleshooting and error confirmation and also provides a description of the error codes and the methods for responding to them.

(b) To find the storage locations of the error codes in the FL-net module. . .
  • Chapter 8.5.2 provides information on the storage destination for the error codes for the buffer memory.

● Structure of this manual

(1) Settings from GX Developer

(a) The FL-net module performs the parameter settings from GX Developer, allowing the sequence program for performing communication with corresponding equipment to be simplified.

(b) Section 6.3.2 provides a summary of the types of setting screens and the setting items.

(c) Use Section 6.3.2 to set the relevant parameters and write them to the programmable controller CPU for the FL-net module equipped station.

(2) Explanation of the GX Developer setting screen

In this manual, the intelligent function module switch settings from the GX Developer are explained in the format shown below. (Section 6.3.2 (2))
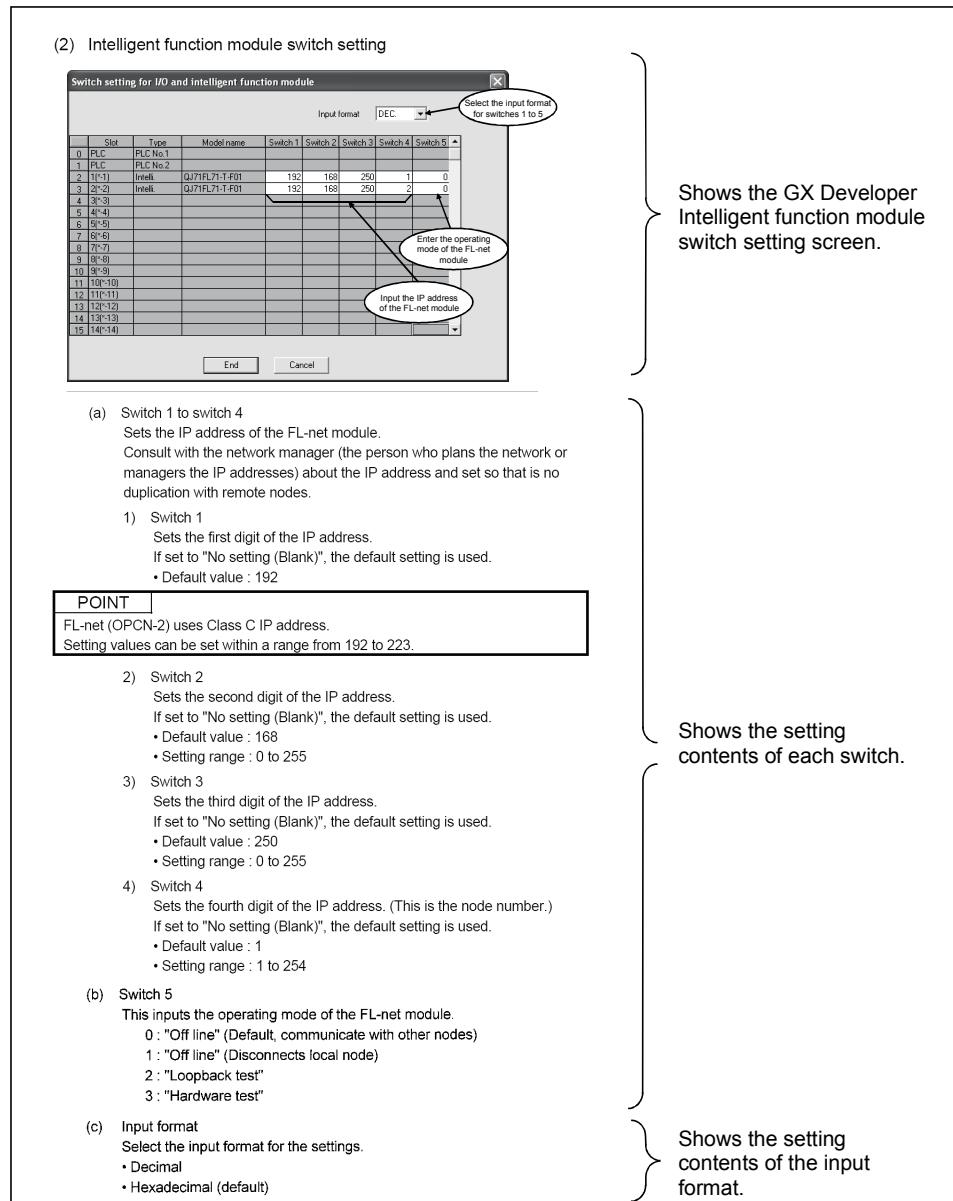
* The page illustrated above is provided for example only and is different from any actual page.

About the Generic Terms and Abbreviations

Unless otherwise stated, the following generic terms and detailed names are used for explaining the QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2 type FL-net (OPCN-2) interface module.

Generic terms/Abbreviations	Description of generic terms and abbreviations
GX Developer	Generic product name for the SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV and SWnD5C-GPPW-EVA. ("n" is 4 or greater.) "-A" and "-V" denote volume license product and upgraded product respectively.
GX Works2	Generic product name for SWnDNC-GXW2-E. (n: Version)
GX Configurator-FL	Generic product name for SWnD5C-QFLU and SWnD5C-QFLU-A. ("n" means version) "-A" mean "volume license product" respectively.
Personal computer	IBM PC/AT or 100 % compatible personal computer.
FL-net module	Abbreviation for QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2 type FL-net (OPCN-2) interface module.
Ethernet network system	Abbreviation for 10BASE2, 10BASE5, 10BASE-T/100BASE-TX network system.
Corresponding equipment	Personal computer, calculator, workstation (WS) or other device connected by FL-net (OPCN-2) for data communication.
QCPU	Generic term for Q00JCPU, Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU, Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU, Q12PRHCPU, Q25PRHCPU, Q00UJCPU, Q00UCPU, Q01UCPU, Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q10UDHCPU, Q13UDHCPU, Q20UDHCPU, Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q50UDEHCPU, Q100UDEHCPU.
Basic model QCPU	Generic term for Q00JCPU, Q00CPU, Q01CPU.
High Performance model QCPU	Generic term for Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU.
Process CPU	Generic term for Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU.
Redundant CPU	Generic term for Q12PRHCPU, Q25PRHCPU.
Universal model QCPU	Generic term for Q00UJCPU, Q00UCPU, Q01UCPU, Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q10UDHCPU, Q13UDHCPU, Q20UDHCPU, Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q50UDEHCPU, Q100UDEHCPU.
Windows® 7	Generic term for the following: Microsoft® Windows® 7 Starter Operating System, Microsoft® Windows® 7 Home Premium Operating System, Microsoft® Windows® 7 Professional Operating System, Microsoft® Windows® 7 Ultimate Operating System, Microsoft® Windows® 7 Enterprise Operating System 32-bit version and 64-bit version of Windows® 7 are described as "Windows® 7 (32-bit) and "Windows® 7 (64-bit) respectively.
Windows Vista®	Generic term for the following: Microsoft® Windows Vista® Home Basic Operating System, Microsoft® Windows Vista® Home Premium Operating System, Microsoft® Windows Vista® Business Operating System, Microsoft® Windows Vista® Ultimate Operating System,

	Microsoft® Windows Vista® Enterprise Operating System
Generic terms/Abbreviations	Description of generic terms and abbreviations
Windows XP®	Generic term for the following: Microsoft® Windows® XP Professional Operating System, Microsoft® Windows® XP Home Edition Operating System

Product Composition

This unit is comprised of the following products.

Model Name	Product Name	Quantity
QJ71FL71-T-F01	QJ71FL71-T-F01 FL-net (OPCN-2) interface module	1
QJ71FL71-B5-F01	QJ71FL71-B5-F01 FL-net(OPCN-2)interface module	1
QJ71FL71-B2-F01	QJ71FL71-B2-F01 FL-net(OPCN-2) interface module	1
QJ71FL71-T	QJ71FL71-T FL-net (OPCN-2) interface module	1
QJ71FL71-B5	QJ71FL71-B5 FL-net (OPCN-2) interface module	1
QJ71FL71-B2	QJ71FL71-B2 FL-net (OPCN-2) interface module	1
SW0D5C-QFLU-E	GX Configurator-FL Version 1 (Single license product)　　(CD-ROM)	1
SW0D5C-QFLU-E-A	GX Configurator-FL Version 1 (Volume license product)　　(CD-ROM)	1

1

1 INTRODUCTION

This manual applies to the MELSEC-Q Series QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2 type FL-net (OPCN-2) interface modules (hereafter called the FL-net module) and provides information about the specifications, procedures used up to operation, the methods of data communication, inspection, maintenance and troubleshooting.

(1) FL-net (OPCN-2) versions
The FL-net module supports the following FL-net (OPCN-2) versions.

FL-net (OPCN-2) version	FL-net module	Ethernet standard
FL-net (OPCN-2) Version 2.00	QJ71FL71-T-F01	10BASE-T/100BASE-TX
	QJ71FL71-B5-F01	10BASE5
	QJ71FL71-B2-F01	10BASE2
FL-net (OPCN-2) Version 1.00	QJ71FL71-T	10BASE-T
	QJ71FL71-B5	10BASE5
	QJ71FL71-B2	10BASE2

(2) Coexistence of FL-net (OPCN-2) Version 2.00 and Version 1.00
Since there is no compatibility between FL-net (OPCN-2) Version 2.00 and FL-net (OPCN-2) Version 1.00, connections and communications are not allowed between these versions.
This incompatibility applies to the case of connecting another manufacturer's product.

(3) Reuse of sequence programs and network equipment
Existing sequence programs and network equipment can be used between FL-net (OPCN-2) Version 2.00 and FL-net (OPCN-2) Version 1.00 modules.

1.1 What is the FL-net (OPCN-2)?

FA-net (OPCN-2) (the generic term for a network featuring FA link protocol) is standardized by the Japan FA Open Systems Promotion Group (JOP) of the Manufacturing Science and Technology Center, a group affiliated with the Ministry of Economy, Trade and Industry (the former Ministry of International Trade and Industry.) The FA link protocol is intended for the FL-net to be used for data exchange between various control modules in manufacture systems such as programmable controller, robot controller (RC) and numerical control module (NC), and personal computers for control.
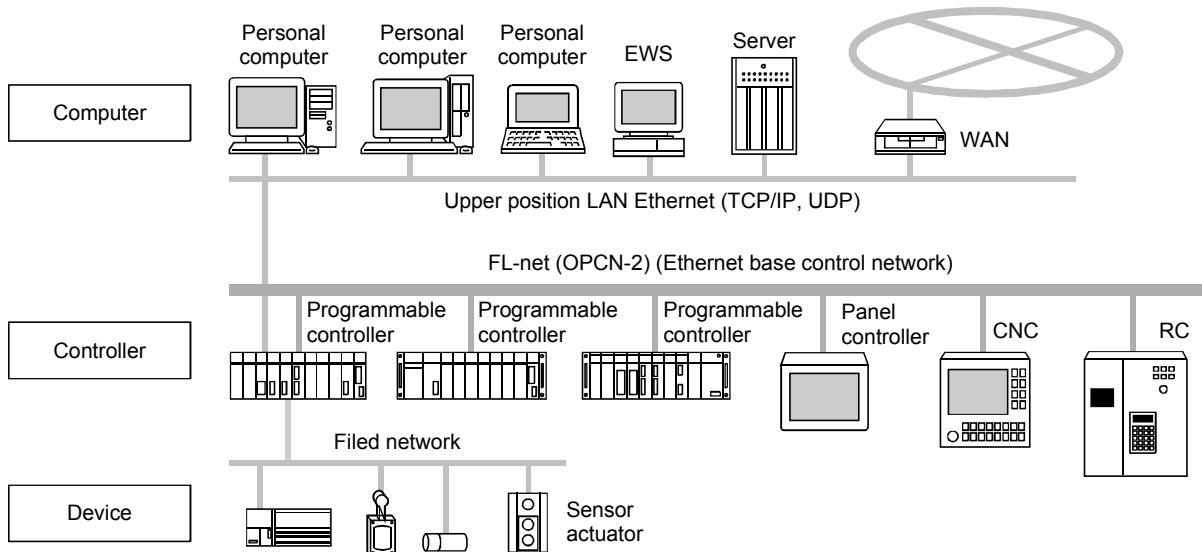
1.2 Features of the FL-net (OPCN-2)

The FL-net (OPCN-2) has the following features.

(1)   Overall features of the FL-net (OPCN-2)

(a)   Realizes multi-vendor support
The FL-net (OPCN-2) can be interconnected to controllers, programmable controllers and other devices for manufacturers' programmable controllers or numerically controlled devices (CNC) and other devices that are very different and provide control and monitoring.

(b)   Complies to standard specifications
It can use components commonly used for office automation equipment using Ethernet network equipment (such as transceivers, hubs, cables and LAN cards for Personal computer).

(c)   Designed for future speed increases
Anticipates future transmission speed increases 10 Mbps $\rightarrow$ 100 Mbps $\rightarrow$ 1 Gbps.

(d)   For large-scale networks
Up to 254 modules of equipment (nodes) can be connected.
(Of the 254 modules, 249 can be used for control. The remaining five modules are assigned for failure diagnosis.)

(e)   Two types of communication functions to match the application
Supports both types of communication functions: cyclic transmission which is a common memory function that allows each node to normally share the same data and message communication function in which only the required data is acquired when needed.

(f)   Large-capacity common memory
The common memory is large: 8 k bits + 8 k words.

(g)   Masterless method provides high reliability
Because there is no master and because the participation and release of each node does not affect communication of remote nodes, any node can freely turn the power supply on and off or perform maintenance.

(2)   Features of the FL-net module

(a)   Data consistency
In area 2 (word area), double word (32-bit) data consistency (the separation prevention (∗1)) is guaranteed.

∗   1: The separation prevention
The separation prevention is the data that has the meaning in a 2-word (32-bits) for current value for the positioning module and it uses the timing of cyclic transmission to prevent the new data and old data from being separated in 1-word units (16-bits).

If the following conditions, 1) to 4), are met in common memory assignment, double word (32-bit) data consistency is automatically guaranteed.
1) The first address of area 1 (bit area) is multiples of 2.
2) The size of area 1 (bit area) is multiples of 2.
3) The first address of area 2 (word area) is multiples of 2.
4) The size of area 2 (word area) is multiples of 2.

(b)   The modules available for the cable used
QJ71FL71-T-F01 - Supports 10BASE-T/100BASE-TX
QJ71FL71-T - Supports 10BASE-T
QJ71FL71-B5-F01, QJ71FL71-B5 - Supports 10BASE5
QJ71FL71-B2-F01, QJ71FL71-B2 - Supports 10BASE2

(c)   Supports the PING command response function
When there is a PING command from a corresponding node, the FL-net module responds to the PING command.

(d)   Equipped with self-diagnosis function
The FL-net module can perform Hardware test and self-return test.

<Basic structure of FL-net (OPCN-2) protocol>

Application layer		Controller · Interface	
FA Link protocol layer		Cyclic transmission	Cyclic transmission
			Message transmission
		Token function	
Transport layer		UDP	
Network layer		IP	
Data Link layer		Ethernet (ISO/IEC8802-3)	
Physical layer			

FL-net (OPCN-2) Protocol
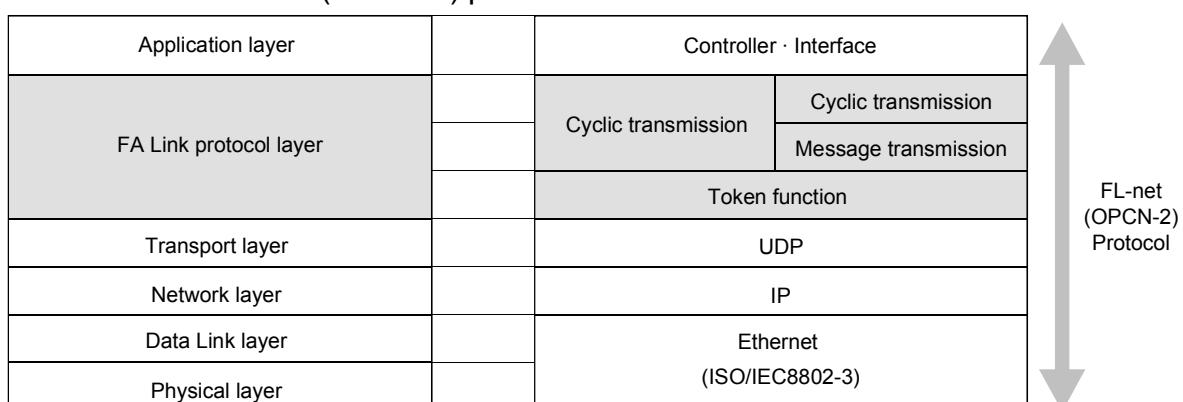
(e)   Easy setting by using GX Configurator-FL
Using GX Configurator-FL, which is separately available, can reduce steps for sequence programs because on-screen configuration is available for the FL-net module.
In addition, it makes checking of the modules' settings and operations easy.

1.3 Frequently Asked Questions about the FL-net (OPCN-2)

The following are some of questions commonly asked about FL-net module (OPCN-2). Please use them for your reference.

	Question	Answer
1	What is Ethernet?	Ethernet is a specification for defining the types of cables that is used in a Local Area Network (LAN). With Ethernet, data can be transferred among computers at a communication speed of 10 Mbps to 100 Mbps. Currently, the Ethernet most used for office applications is the 100 Mbps twisted pair cable (UTP). Ethernet uses the software protocol that is sent out by many multi-vendors to make communication possible.
2	What is FL-net (OPCN-2)?	FL-net (OPCN-2) is a network that connects FA controllers, such as programmable controllers or numerical control devices (CNC) and performs high-speed interactive exchanging of control data among these controllers. The cables and other components are the same as those used in Ethernet systems.
3	What is the difference between FL-net (OPCN-2) and Ethernet?	Ethernet connects host computers, personal computer and other types of controllers and is used for giving production instructions, collecting various production data and control applications. In addition, FL-net (OPCN-2) is used for making connections among controllers and using it for the high-speed exchange of controller data. When there is one controller module and when the FL-net (OPCN-2) is mounted on both the Ethernet for the host and for among the controllers, use extreme care not to mis-connect the cables.
4	How do you use the FL-net (OPCN-2)?	The FL-net module is mounted to FA controllers such as programmable controllers or numerical control devices (CNC) and by simply performing the link allocation settings for the station number (node number) and common memory (link register) in the same way as a "CPU link module" on a conventional computer, the cyclic sending and receiving of data among the controllers can be performed. Accordingly, no special communication program is required for the programmable controller or other control devices. Moreover, no special communication program is required for reading and rewriting programmable controller memory or communication parameter data from the personal computer. It should be noted that each controller will need a program if data transmission is performed using message transmission interactively among the controllers.
5	What is protocol? Specifically, what protocol does FL-net (OPCN-2) support?	Protocol consists of the rules necessary for communicating. FL-net (OPCN-2) supports UDP/IP and uses the dedicated "FA Link Protocol" for FL-net (OPCN-2) for positioning on the upper layer.
6	Can FL-net (OPCN-2) be connected to a conventional personal computer?	The FL-net module mounted to FA controllers such as programmable controllers and numerical control devices (CNC) have intelligent modules that have processors in the boards. Ethernet cards are referred to as "dumb boards", which means that they use a non-intelligent format so their use will depend on the performance of the personal computer and how it is used. Generally speaking, the use of the intelligent type FL-net (OPCN-2) board is recommended.

(Continued from previous page)

	Question	Answer
7	What is topology?	Network topology indicates the layout of the wiring. Generally speaking, there are three main layouts: star (tree), bus and ring. It is probably easier to think of these as logical arrangements rather than the physical layout of the cables. The 10BASE-T/100BASE-TX used on FL-net (OPCN-2) is star topology. 10BASE5 is bus topology.
8	What is the relationship between the type of network cable and the length and number of modules that can be connected?	The following are some of the standards, characteristics and limitations of Ethernet cable, which is the most commonly used type. Note: Values shown in ( ) indicate that a repeater is used. (1) 10BASE-T/100BASE-TX 　　Twisted pair cable (STP/UTP). The maximum transmission distance per segment is 100 m (500 m). The maximum number of modules that can be connected per segment is 254. (2) 10BASE5 　　Thick coaxial cable (yellow cable). The maximum transmission distance per segment is 500 m (2500 m). The maximum number of modules that can be connected per segment is 100 (254). (3) 10BASE-FL 　　Optical fiber cable. The maximum transmission distance per segment is 2000 m. The maximum number of modules that can be connected per segment is 254.
9	Are special Ethernet specifications required for systems using FL-net (OPCN-2)?	No. When constructing a FL-net (OPCN-2) system, uses Ethernet specifications (IEEE802.3 standards). There are no special specifications.
10	How is connection with FL-net (OPCN-2) made?	Different types of Ethernet media can be interconnected to Ethernet cable by using devices such as repeaters and media conversion adapters. These products are sold by a most vendors.
11	What is the best cables to use when constructing a FL-net (OPCN-2) system?	The following are the most commonly used cables. • Trunk lines : 10BASE5 (Thick coaxial cable, yellow cable) • Inside control panels and for office applications: 10BASE-T/100BASE-TX (Twisted pair cable, STP/UTP category 5 or more) • Locations with high-voltage power supplies or other types of electric noise: 10BASE-FL (optical fiber cable)
12	How do you set the IP address for FL-net (OPCN-2)?	The FL-net (OPCN-2) IP address is network address: 192.168.250. Host number (node number): 1 to 254 is standard. Note that node numbers 250 to 254 are reserved for maintenance use.
13	What is the compatibility and interconnectability of FL-net (OPCN-2) compatible equipment?	There is a certification organization for FL-net (OPCN-2) that performs compatibility and interconnectability testing. Equipment that pass these tests are issued a certificate to show that they are FL-net (OPCN-2) compatible equipment.

1.4 FL-net (OPCN-2) Version Information

The FL-net (OPCN-2) authorization version of the FL-net module can be confirmed with the buffer memory (Address: 9CA$_H$).
The FL-net (OPCN-2) protocol version of the FL-net module can be checked with the buffer memory (Address: 9C9$_H$).
(Refer to Section 3.2.6 (2).)

2 SAFETY PRECAUTIONS

The beginning of this manual contains "SAFETY PRECAUTIONS". Read and understand them before using this product.
In addition, before using this product read this manual and all other related manuals introduced in this manual. Always keep safety top priority when using this equipment.

2

MEMO

2

3 FL-net MODULE

3.1 System Configuration

This section introduces the system configuration possible using FL-net module combinations.

(1) Basic system
The FL-net module can communicate with FL-net (OPCN-2) compatible personal computer and equipment. (Use dedicated FL-net (OPCN-2) wiring for the Ethernet wiring.)
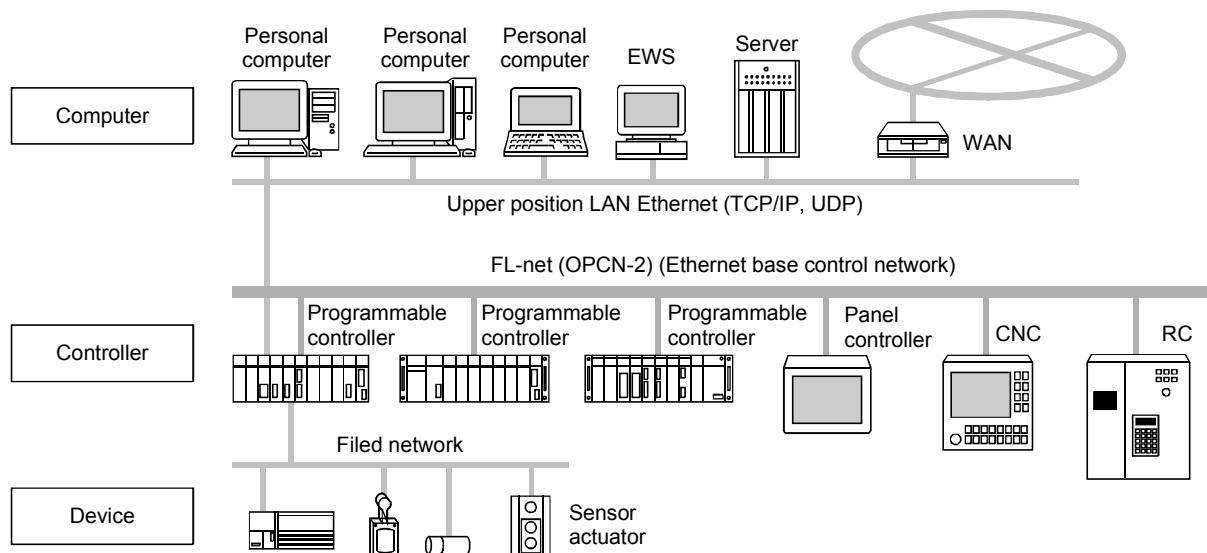
(2) Mixed system
The following is the type of communication possible with mixed systems.

(a) Cyclic transmissions
Data transmissions can be performed within FL-net (OPCN-2).
Communication with other networks can be performed by interchanging
the CPU module and using a sequence program.

(b) Message transmissions (transient transmission)
Data transmissions can be performed within FL-net (OPCN-2).
Communication with other networks can be performed by interchanging
the CPU module and using a sequence program.

3

Ethernet

FL-net (OPCN-2)

MELSECNET/H
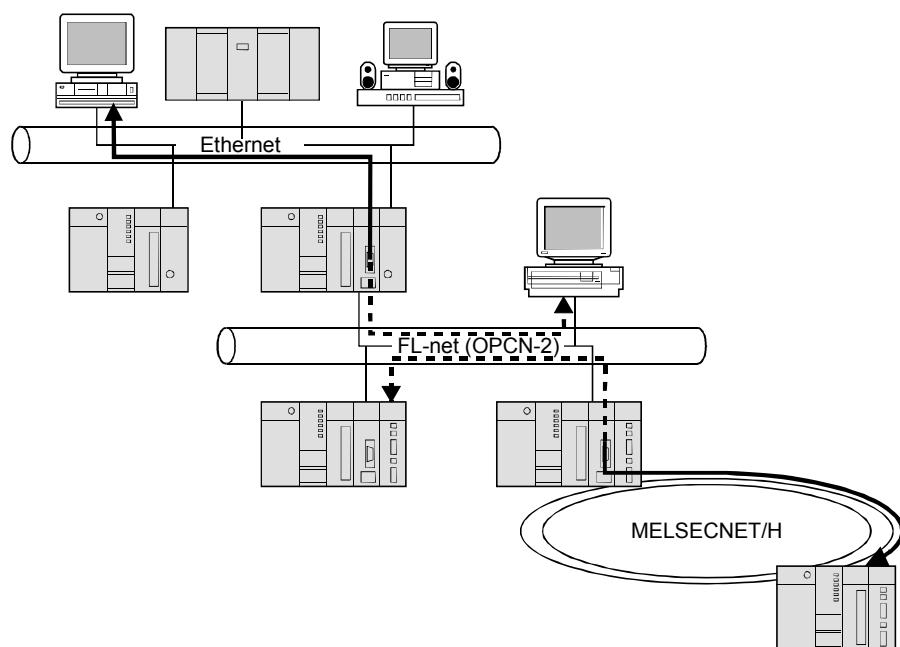
3.1.1 Applicable systems

This section describes the applicable systems.

(1) Applicable modules and base units, and No. of modules

(a) When mounted with a CPU module

The table below shows the CPU modules and base units applicable to the FL-net module and quantities for each CPU model.

Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient.

Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

Applicable CPU module		No. of modules [1]	Base unit [2]	
CPU type	CPU model		Main base unit	Extension base unit
Basic model QCPU	Q00JCPU	Up to 8	○	○
	Q00CPU	Up to 24		
	Q01CPU			
High Performance model QCPU	Q02CPU	Up to 64	○	○
	Q02HCPU			
	Q06HCPU			
	Q12HCPU			
	Q25HCPU			
Process CPU	Q02PHCPU	Up to 64	○	○
	Q06PHCPU			
	Q12PHCPU			
	Q25PHCPU			
Redundant CPU	Q12PRHCPU	Up to 53	×	○
	Q25PRHCPU			
Universal model QCPU	Q00UJCPU	Up to 8	○	○
	Q00UCPU	Up to 24		
	Q01UCPU			
	Q02UCPU	Up to 36		
	Q03UDCPU	Up to 64		
	Q04UDHCPU			
	Q06UDHCPU			
	Q10UDHCPU			
	Q13UDHCPU			
	Q20UDHCPU			
	Q26UDHCPU			
	Q03UDECPU			
	Q04UDEHCPU			
	Q06UDEHCPU			
	Q10UDEHCPU			
	Q13UDEHCPU			
	Q20UDEHCPU			
	Q26UDEHCPU			
	Q50UDEHCPU			
	Q100UDEHCPU			
Safety CPU	QS001CPU	N/A	×	× [3]

(CPU type column grouped under "Programmable controller CPU")

Applicable CPU module		No. of modules ∗1	Base unit ∗2	
CPU type	CPU model		Main base unit	Extension base unit
C Controller module	Q06CCPU-V	Up to 64	○	○
	Q06CCPU-V-B			
	Q12DCCPU-V			

○: Applicable, ×: N/A

∗1: Limited within the range of I/O points for the CPU module.
∗2: Can be installed to any I/O slot of a base unit.
∗3: Connection of extension base units is not available with any safety CPU.

REMARK

When using with a C Controller module, refer to the C Controller Module User's Manual.

(b) Mounting to a MELSECNET/H remote I/O station
The table below shows the network modules and base units applicable to the FL-net module and quantities for each network module model.
Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient.
Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

Applicable network module	No. of modules ∗1	Base unit ∗2	
		Main base unit of remote I/O station	Extension base unit of remote I/O station
QJ72LP25-25	Up to 64	○	○
QJ72LP25G			
QJ72LP25GE			
QJ72BR15			

○: Applicable, ×: N/A

∗1: Limited within the range of I/O points for the network module.
∗2: Can be installed to any I/O slot of a base unit.

REMARK

The Basic model QCPU or C Controller module cannot create the MELSECNET/H remote I/O network.

    (2) Support of the multiple CPU system
      When using the FL-net module in a multiple CPU system, refer to the QPU
      User's Manual (Multiple CPU System) first.

        (a) Compatible FL-net module
            1) QJ71FL71-T-F01, QJ71FL71-B5-F01, and QJ71FL71-B2-F01
                These models have been first released as function version B,
                supporting the multiple CPU system.
            2) QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2
                Use a module of function version B.

        (b) Intelligent function module parameters
            Write intelligent function module parameters to only the control CPU of the
            FL-net module.

(3) Supported software packages
Relation between the system containing the FL-net module and software package is shown in the following table.
GX Developer or GX Works2 is necessary when using the FL-net module.

		Software version		
		GX Developer	GX Configurator-FL	GX Works2
Q00J/Q00/Q01CPU	Single CPU system	Version 7 or later	Version 1.10L or later	Version 1.15R or later
	Multiple CPU system	Version 8 or later		
Q02/Q02H/Q06H/ Q12H/Q25HCPU	Single CPU system	Version 4 or later	SW0D5C-QFLU-E 00A or later	
	Multiple CPU system	Version 6 or later		
Q02PH/Q06PHCPU	Single CPU system	Version 8.68W or later	Version 1.13P or later	Version 1.87R or later
	Multiple CPU system			
Q12PH/Q25PHCPU	Single CPU system	Version 7.10L or later		
	Multiple CPU system			
Q12PRH/Q25PRHCPU	Redundant CPU	Version 8.45X or later	Version 1.14Q or later	
Q00UJ/Q00U/Q01UCPU	Single CPU system	Version 8.76E or later	Version 1.23Z or later	Version 1.15R or later
	Multiple CPU system			
Q02U/Q03UD/Q04UDH/ Q06UDHCPU	Single CPU system	Version 8.48A or later		
	Multiple CPU system			
Q10UDH/Q20UDHCPU	Single CPU system	Version 8.76E or later		
	Multiple CPU system			
Q13UDH/Q26UDHCPU	Single CPU system	Version 8.62Q or later		
	Multiple CPU system			
Q03UDE/Q04UDEH/ Q06UDEH/Q13UDEH/ Q26UDEHCPU	Single CPU system	Version 8.68W or later		
	Multiple CPU system			
Q10UDEH/Q20UDEHCPU	Single CPU system	Version 8.76E or later		
	Multiple CPU system			
Q50UDEH/Q100UDEHCPU	Single CPU system	Cannot be used	Cannot be used	Version 1.31H or later
	Multiple CPU system			
If installed to MELSECNET/H remote I/O station		Version 6 or later	SW0D5C-QFLU-E 00A or later	Version 1.40S or later

(4) Restrictions system configuration

Since the FL-net protocol of the FL-net (OPCN-2) Version 2.00 modules is different from that of the FL-net (OPCN-2) Version 1.00 modules, the following two types of modules cannot communicate each other.

FL-net(OPCN-2) Version 2.00 module	FL-net(OPCN-2) Version 1.00 module
QJ71F71-F01, QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01 Version 2.00 products from other manufacturers	QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2, Version 1.00 products from other manufacturers
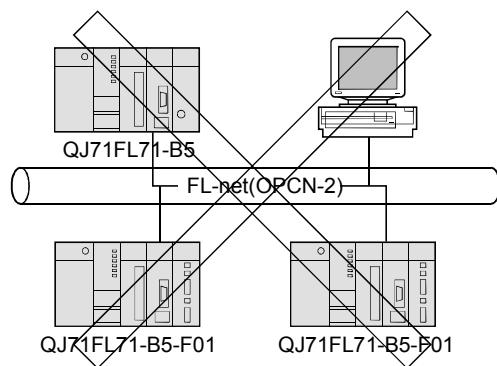
3.1.2 Equipment required when configuring the network

The following introduces the component equipment of the network.
Since installing the network requires the utmost of safety, always have the work done
by trained specialists.

(1) When configuring a network with QJ71FL71-B5(-F01)

(a) When connecting with 10BASE5.
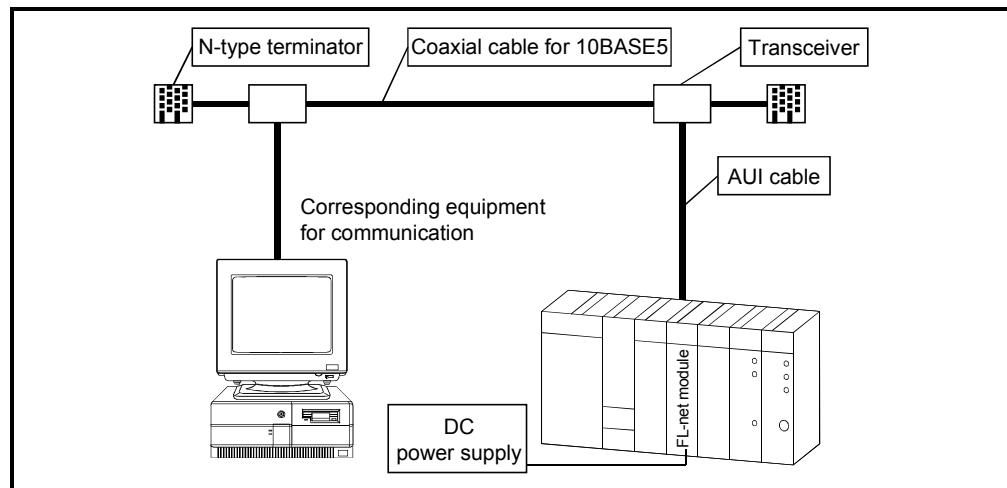
1) Makes sure that the coaxial cable for 10BASE5, N-type terminator,
transceiver, AUI cable (transceiver cable) all meet Ethernet standards.

2) Use a transceiver with an operating SQE TEST (Signal Quality Error
Test) or heart beat.

3) Use the power supply for the transceiver that satisfies the transceiver
and AUI cable specifications.

REMARK

Electrical characteristics of the transceiver
• Input terminal voltage 12 V $^{-6\%}$ to 15 V $^{+5\%}$
• AUI cable direct resistance 40 Ω / km or less, maximum length: 50 m
• Maximum current consumption: 500 mA or less

In consideration of the above characteristics, the power supply for the transceiver will be 13.28V to 15.75V.

POINT

(1) Consult a network specialist for information about the required equipment.

(2) When 10BASE5 is used and countermeasures against noise and high-frequency waves are required for the installation environment of the QJ71FL71-B5(-F01), attaching a ferrite core to the transceiver side of the AUI cable is often effective.
(Ferrite core used in our testing: ZCAT2032-0930 manufactured by TDK Corporation)
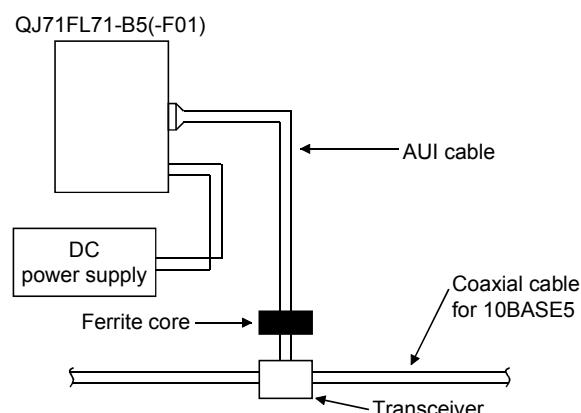
(2) When configuring a network with QJ71FL71-T(-F01)

    (a) For the QJ71FL71-T-F01

When connecting a QJ71FL71-T-F01 to a network, either a 10BASE-T or 100BASE-TX can be used.

The QJ71FL71-T-F01 detects whether it is 10BASE-T or 100BASE-TX, and the full-duplex or half-duplex transmission mode according to the hub.

For connection to the hub without the auto detection function, set the half-duplex mode on the hub side.

    1) Connection using the 100BASE-TX
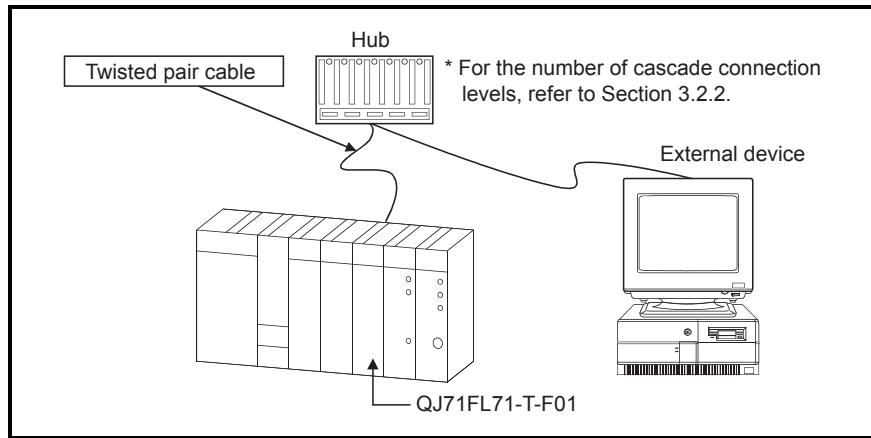
Use equipment that meets IEEE802.3 100BASE-T specifications. (Equipment from the HUB and below)

- Shielded twisted pair cable (STP) (straight cable), category 5 or higher [1]
- RJ45 jack.
- Hub for 100 Mbps.

[1] A crossing cable cannot be used.

POINT

Consult a network specialist for information about the required equipment. During the high-speed communication (100 Mbps) via 100BASE-TX connection, a communication error may occur due to the effect of high frequency noise from devices other than programmable controllers in a given installation environment. The following are countermeasures on the QJ71FL71-T-F01 side to prevent the effect of high frequency noise when constructing network systems.

(1) Wiring
- Do not bundle the twisted pair cables with the main circuit and the power wires, and do not install them close to each other.
- Place the twisted pair cables in a duct.

(2) 10 Mbps communication
- Use a data transmission rate of 10 Mbps by changing the hub connected to the QJ71FL71-T-F01 to a 10 Mbps hub.

2) Connection using 10BASE-T
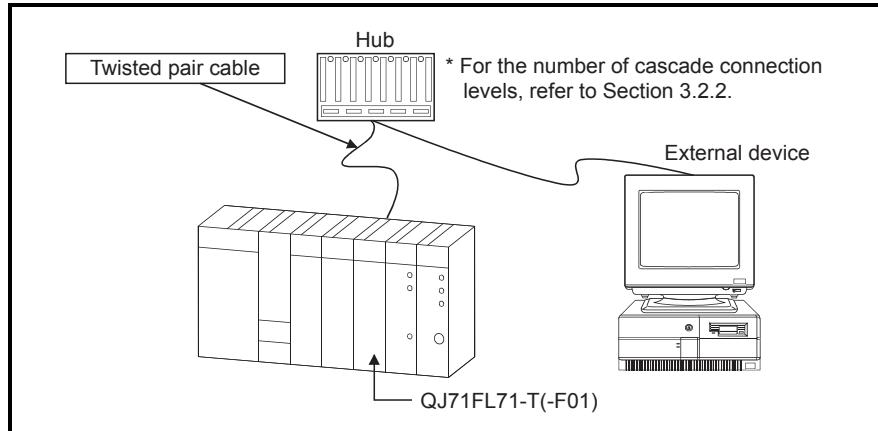
Use equipment that meets IEEE802.3 10BASE-T specifications.
(Equipment from the HUB and below)
• Unshielded twisted pair cable (UTP) (straight cable) or shielded
  twisted pair cable (STP) (straight cable), category 3 or higher[1]
• RJ45 jack
• Hub for 10 Mbps
  [1] A crossing cable cannot be used.

POINT
Consult a network specialist for the equipment required.

(b) For the QJ71FL71-T
When connecting the QJ71FL71-T to a network, 10BASE-T can be used.
For network equipment, refer to (2) (a) 2).

(3) When configuring a network with QJ71FL71-B2(-F01)

(a) Connection using 10BASE2
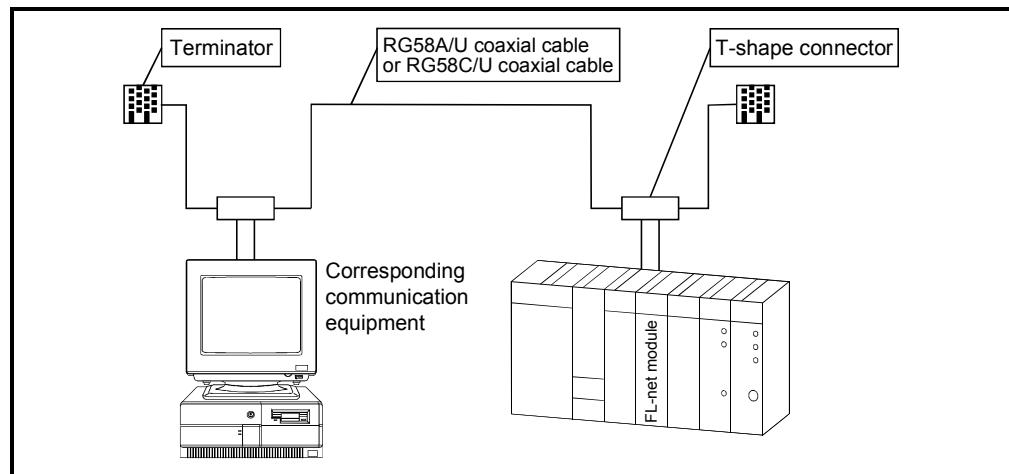
1) Use devices that meet the standards of IEEE802.3 and 10BASE2.
 • RG58A/U or RG58C/U (coaxial cable 50 Ω)
 • BNC-type Terminator (product equivalent to 221629-4
   manufactured by Tyco Electronics AMP K. K.)
 • T-shaped adapter (product equivalent to UG-274/U(15)
   manufactured by Hirose Electric Co., Ltd.)

POINT
Consult a network specialist for the equipment required.

3.2 Specifications

This section explains the FL-net module performance specifications and transmission specifications.

3.2.1 General specifications

For the general specifications for the FL-net module, refer to the user's manual for the CPU module that is to be used.

3.2.2 Performance specifications

The following are the performance specifications of the FL-net module.

Table 3.1 Performance specifications

Items		Specifications			
		QJ71FL71-B5-F01/ QJ71FL71-B5	QJ71FL71-T-F01	QJ71FL71-T	QJ71FL71-B2-F01/ QJ71FL71-B2
		10BASE5	10BASE-T/ 100BASE-TX	10BASE-T	10BASE2
Transmission specifications	Data transmission speed	10Mbps (Half duplex)	10Mbps (Half duplex) 100Mbps (Full duplex/Half duplex)	10Mbps (Half duplex)	10Mbps (Half duplex)
	Transmission method	Base band			
	Electric interface	IEEE802.3 standard (CSMA/CD standard)			
	Transmission protocol	UDP/IP FA link protocol			
	Maximum distance between nodes	2500m	—		925m
	Maximum segment length	500m	100m		185m
	Maximum number of nodes in system	254			
	Maximum number of nodes	100/segment	For 10BASE-T, Maximum 4 bases for Cascade connection ($*^1$) For 100BASE-TX, Maximum 2 bases for Cascade connection ($*^1$)	Maximum 4 bases for Cascade connection	30/segment
	Minimum node interval	2.5m	—		0.5m
	Cyclic data volume	Maximum (8 k bits + 8 k words)/system Maximum (8 k bits + 8 k words)/node			
	Message data volume	Maximum 1024 bytes			

(Continued from previous page)

Items		Specifications			
		QJ71FL71-B5-F01/ QJ71FL71-B5	QJ71FL71-T-F01	QJ71FL71-T	QJ71FL71-B2-F01/ QJ71FL71-B2
		10BASE5	10BASE-T/ 100BASE-TX	10BASE-T	10BASE2
Link data specifications	Common memory area	Area 1 (bit area): 8 k bits Area 2 (word area): 8 k words			
	Virtual address space and physical memory	—			
	Error log memory area	512 words			
	Status memory area	Bit area: 2 k bits Word area: 2 k words			
	Local node network parameter setting area	QJ71FL71-B5-F01, QJ71FL71-T-F01, QJ71FL71-B2-F01: 128 words QJ71FL71-B5, QJ71FL71-T, QJ71FL71-B2: 96 words			
	Other node network parameter setting area	2048 words			
	Network parameter acquisition area	512 words			
	Device profile memory area	512 words			
	Message area (Transient area)	Maximum 1024 bytes $\times$ 2 (1 for each of transmit and receive)			
Transmission specifications	Message transmission	500 ms or less (1:1 Arrival time of one-way message)			
	Token start time	New participation: Start time = 3000 + (Minimum node number/ 8 remaining) $\times$ 4 + 1200ms Halfway participation: Participation time = Refresh cycle $\times$ 3 + local node number $\times$ 4ms			
	Refresh time	Refer to "Appendix 6.1 (6)".			
	Transmission delay time	Refer to "Appendix 6.1 (7)".			
Number of input/output points		32 points (I/O assignment: intelligent)			
5VDC internal current consumption		0.50A	0.50A		0.60A ($*2$)
Noise resistance		According to the power supply specifications of the station to which the FL-net module is mounted.			
Voltage resistance					
Insulation resistance					
External dimensions		98 (3.86 in.) (H) $\times$ 27.4 (1.08 in.) (W) $\times$ 90 (3.54 in.) (D)mm			
Weight		0.12kg	0.11kg		0.13kg ($*2$)

$*1$: This number applies when a repeater hub is used.

　　 For the number when a switching hub is used, consult the manufacturer of the switching hub.

$*2$: The 5VDC internal current consumption and weight of the product whose first 5 digits of serial No. are

　　 05079 or earlier are as follows:

　　• 5VDC internal current consumption: 0.70A

　　• Weight: 0.14kg

3.2.3 FL-net module function list

Table 3.2 shows the function list of the FL-net module.

Table 3.2 FL-net module functions list

Function	Description	Reference section
Cyclic transmission	(1) Communication of large data volume The common memory method enables cyclic transmission of data as follows. • Area 1 (bit area): 8 k bits (512 words) • Area 2 (word area): 8 k words (8192 words) (Transmitting and receiving up to 8. 5 k words/node cyclic data is possible.) (2) Guaranteed refresh cycle time Since the permissible refresh cycle time is dynamically determined, message transmission (transient transmission) can be controlled with the refresh cycle time guaranteed. (3) High-speed cyclic transmission by 100BASE-TX connection (the QJ71FL71-T-F01 only) By changing the operation mode in the intelligent function module switch setting, high-speed cyclic transmission at 100Mbps is available by 100BASE-TX connection. This function has been certified by JEMA (Japan Electrical Manufacturer's Association), and can be used from the first released products.	6.2
Message transmission	(1) Transparent message transmission • Message data (up to 1024 bytes) for the message area of a specified node can be sent and received. • Possible to send and receive transaction codes other than those used by the system. (2) Reading and writing of data in word blocks. By using the virtual memory access method, it is possible to read and write the virtual address space data assigned by each manufacturer in word units. (3) Message return data response It is possible to return the received data as-is whenever a message return command is received. (4) Reading of the network parameters It is possible to read the network parameters for each node (such as vendor name, token monitoring time, etc.). (5) Reading and clearing of log information It is possible to read and clear the communication log information held by each node. (6) Reading of device profile It is possible to read the device profile data held by each node.	6.2
Self diagnosis function	(1) Hardware test The GX Developer can be used to set the hardware test mode to perform hardware testing of the FL-net module. (2) Self-loopback test The GX Developer can be used to set the loopback test mode to perform tests of the send/receive functions of FL-net module and the status of the lines.	6.3.1
Ping command response function	(1) Ping command compatibility It is possible to confirm the IP address of the FL-net module by issuing a ping command to your local station FL-net module from a corresponding device (personal computer, etc.) connected to the FL-net (OPCN-2) network.	8.2(3)
Multiple CPU function compatibility	(1) Multiple CPU functions It is possible to control by optional CPU modules, even when multiple card CPU modules are mounted to the same base unit.	-

(Continued on next page)

Function	Description	Reference section
Parameter setting by GX Configurator-FL	(1) Initial setting Network parameter for common memory assignments, monitoring time and others can be set by GX Configurator-FL. (2) Auto refresh setting It is possible to perform cyclic data auto refresh. (3) Monitor/test The buffer memory and I/O signals of the FL-net module can be monitored and tested.	6.4

3.2.4 I/O signals for the CPU module

The section explains the input/output signals for the FL-net module.

(1) I/O signal list

The I/O signal assignments shown are based on the case where the start I/O No. of the FL-net module is "0000" (mounted to slot 0 of a main base unit).
Device X denotes an input signal from the FL-net module to the CPU module.
Device Y denotes an output signal from the CPU module to the FL-net module.
Table 3.3 lists the I/O signals used for the CPU module.

Table 3.3 I/O signal list for the CPU module

	Signal direction: CPU module ← FL-net module		Signal direction: CPU module → FL-net module	
Input No.	Signal name		Output No.	Signal name
X00	Message transmission normal completion signal ON: Normal completion OFF: —		Y00	Message transmission request ON: Request OFF: —
X01	Message transmission abnormal completion signal ON: Abnormal completion ending OFF: —		Y01	Use prohibited
X02	Receiving message signal ON: Receiving OFF: No signal received		Y02	Message receive completion confirmation ON: Request OFF: —
X03 to X0F	Use prohibited		Y03 to Y0F	Use prohibited
X10	Network parameter write completion signal ON: Completed OFF: —		Y10	Network parameter write request ON: Request OFF: —
X11	Network parameter/join node information read completion signal ON: Completed OFF: —		Y11	Network parameter/join node information read request ON: Request OFF: —
X12	Use prohibited		Y12	Use prohibited
X13	Device profile read completion signal ON: Completed OFF: —		Y13	Device profile read request ON: Request OFF: —
X14	Log information clear completion signal ON: Completed OFF: —		Y14	Log information clear request ON: Request OFF: —
X15	Log information read completion signal ON: Completed OFF: —		Y15	Log information read request ON: Request OFF: —
X16	Use prohibited		Y16 to Y1F	Use prohibited
X17	Use prohibited			
X18	Parameter setting status signal ON: Error OFF: Normal			
X19	Token enter status signal ON: Enter OFF: Leave			
X1A	Use prohibited			
X1B	Use prohibited			
X1C	Module ready ON: Preparation completed OFF: In initialization			
X1D	Use prohibited			
X1E	Use prohibited			
X1F	Watchdog timer error detection signal ON: Detected OFF: Not detected			

IMPORTANT

Do not set any "use-prohibited" signal to ON.
Doing so may cause malfunctions of the CPU module.

(2) Details of the input/output signal

This section explains the ON/OFF timing, conditions and other items related to the input/output signals shown in Table 3.3

Data in ( ) indicates the corresponding device number in Table 3.3

(a) Message transmission normal completion signal/Message transmission abnormal completion signal (X00/X01)

Message transmission request (Y00)

The data is sent by setting the data in the message send area of the buffer memory beforehand and setting of the message transmission request (Y00) to ON. After the send completion confirmation by the message transmission completion signals (X00/X01), set message transmission request (Y00) to off.

For message transmission, refer to Section 6.5.3 (5).
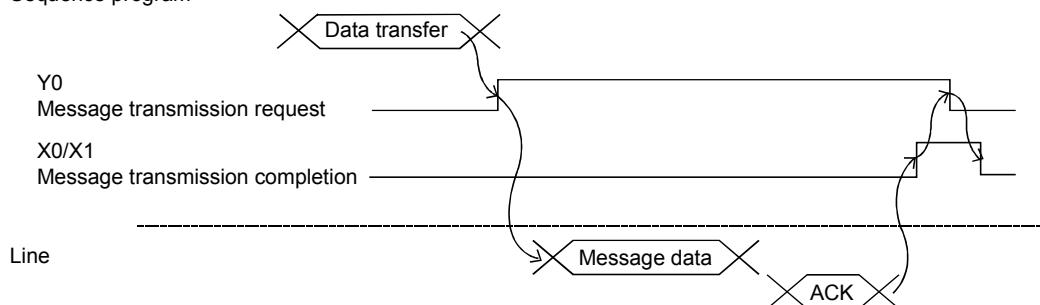
(b) Receiving message signal (X02)

Message receive completion confirmation (Y02)

The data from other nodes is set in the message received area of the buffer memory and the receiving message signal (X02) is set to on.

After the message data has been transferred to the device (read), set the message receive completion confirmation (Y02) to on.

After confirming that the receiving message signal (X02) is off, set the message receive completion confirmation (Y02) to off.

For message receive, refer to Section 6.5.3 (5).
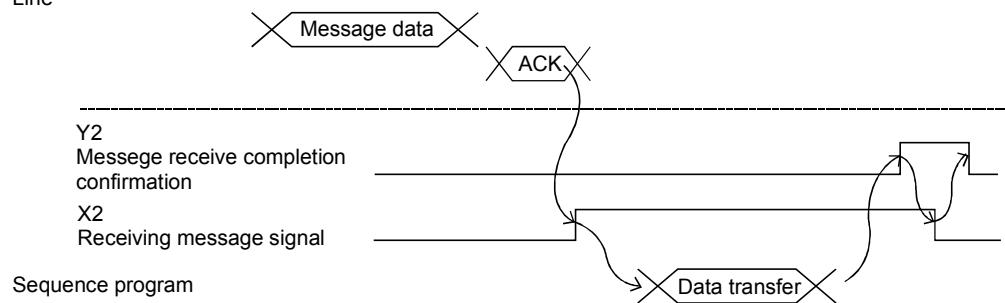
(c) Network parameter write completion signal (X10)
Network parameter write request (Y10)
The data is set in the network parameter area of its local node buffer memory beforehand and the network parameter is registered by setting the network parameter write request (Y10) to on.
After the write completion has been confirmed by the on of the network parameter write completion signal (X10), set the network parameter write request (Y10) to off.
For registration of local node network parameters, refer to Section 6.5.1.

Sequence program
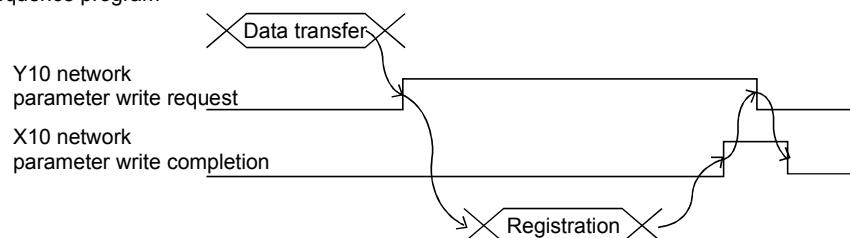
(d) Network parameter/join node information read completion signal (X11)
Network parameter/join node information read request (Y11)
By turning on the network parameter/join node information read request (Y11), data of the target node are read out into the network parameter/join node information acquisition area of the buffer memory.
After the acquisition completion has been confirmed by the on of the network parameter/join node information read completion signal (X11), set the network parameter/join node information read request (Y11) to off.
For the network parameter read, refer to Section 6.5.3 (1).

Sequence program
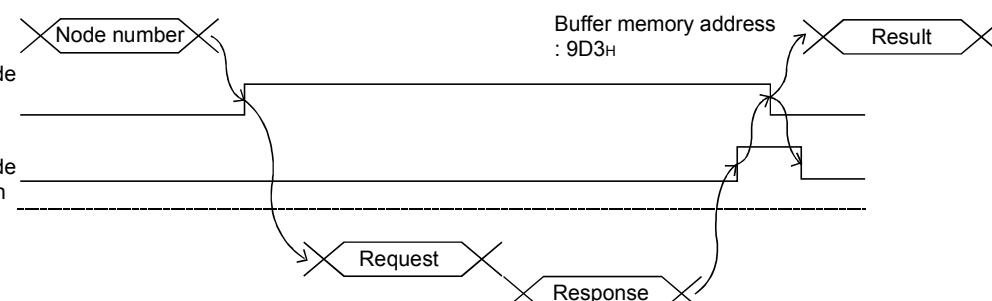
POINT

The switching of network parameter/join node information reading is distinguished by buffer memory address 983$_H$ . . . b15. (Refer to Section 3.2.6.(2))
0: Read network parameter data
1: Read join node data

(e) Device profile read completion signal (X13)
Device profile read request (Y13)
By turning on the device profile read request (Y13), the device profile of the target node is read out into the device profile acquisition area of the buffer memory.
After the acquisition completion has been confirmed by the on of the device profile read completion signal (X13), set the device profile read request (Y13) to off.
For the device profile read, refer to Section 6.5.3 (2).

Sequence program

Buffer memory address : 984H — Node number

Y13
Device profile read request

X13
Device profile read completion

Buffer memory address : 9D4H — Result

Line

Request

Response
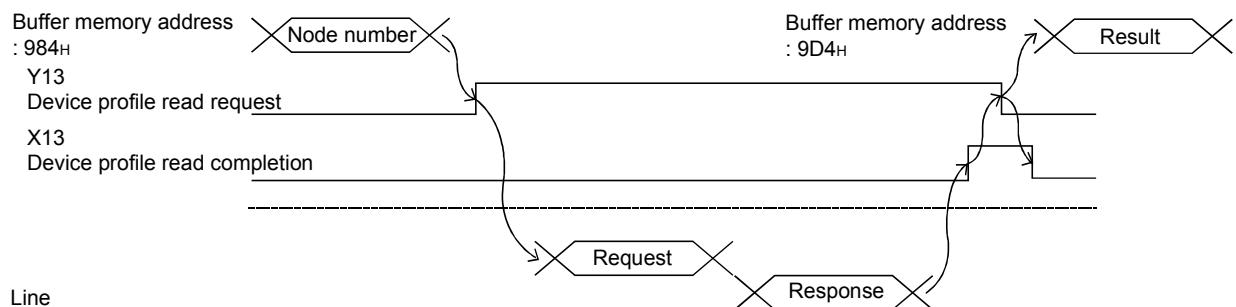
(f) Log information clear completion signal (X14)
Log information clear request (Y14)
By turning on the log information clear request (Y14), the log information of the target node are cleared.
After the completion of the clear has been confirmed by the on of the log information clear completion signal (X14), set the log information clear request (Y14) to off.
For the log information clear, refer to Section 6.5.3 (4).

Sequence program

Buffer memory address : 985H — Node number

Y14
Log information clear request

X14
Log information clear completion

Buffer memory address : 9D5H — Result

Line

Request

Response
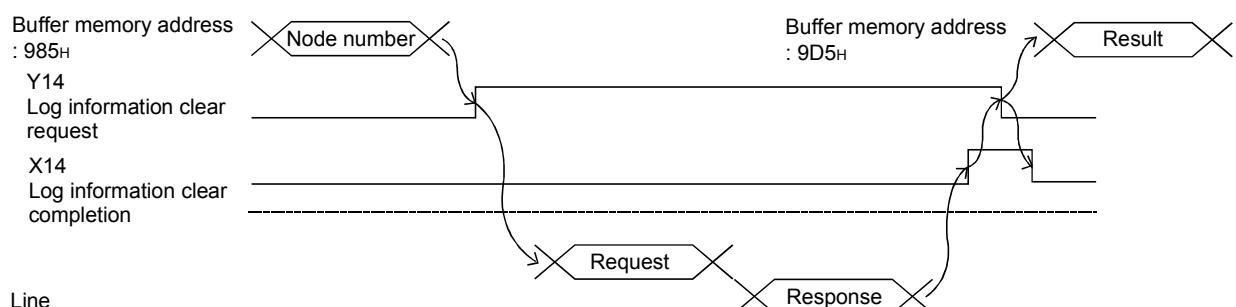
(g) Log information read completion signal (X15)
Log information read request (Y15)
By turning on the log information read request (Y15), the log information of
the target node are read out into the log information acquisition area of the
buffer memory.
After the completion of the acquisition has been confirmed by the on of the
log information read completion signal (X15), set the log information read
request (Y15) to off.
For the log information read, refer to Section 6.5.3 (3).

Sequence program

Buffer memory address : 986H — Node number — Buffer memory address : 9D6H — Result

Y15 Log information read request

X15 Log information read completion

Line — Request — Response
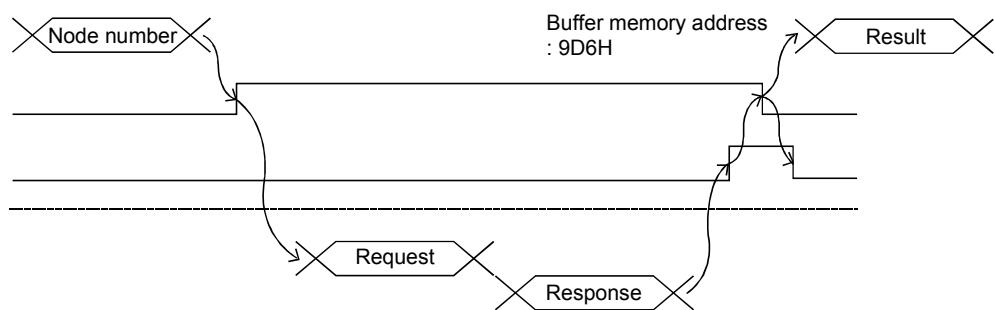
(h) Parameter setting status signal (X18)
When the writing of the network parameter has been completed and a
network parameter setting error is issued, the parameter setting status
signal (X18) is set to on.
For registration of local node network parameters, refer to Section 6.5.1.

Sequencer program

Y10 Network parameter write request

X10 Network parameter write completion

X18 Parameter setting status — Error

Request
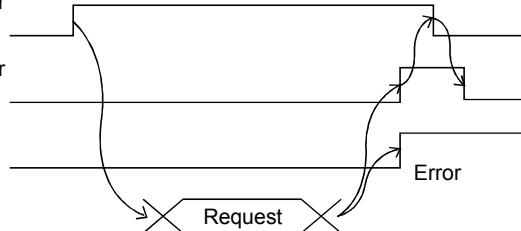
(i) Token enter status signal (X19)

Shows the token participation status to the network. The token enter status signal (X19) is on during token participation.
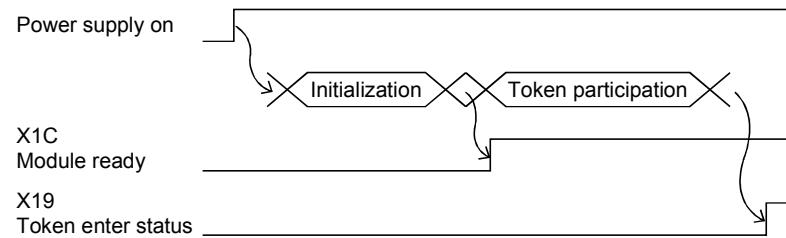
(j) Module ready (X1C)

Shows the results of the initialization of the FL-net module.
If the initialization is normal, module ready (X1C) is set to on.
If module ready (X1C) does not come on, use the intelligent function module switch settings from GX Developer (Refer to Section 6.3.2) to adjust. If the intelligent function module switch settings are normal, the FL-net module will proceed to its self-diagnostic test. (Refer to Section 6.3.1 (1).)
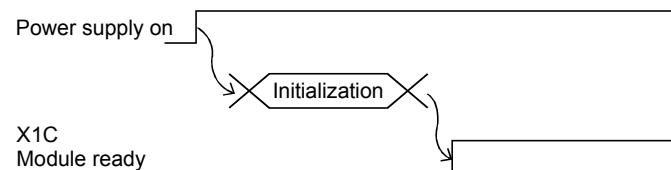
3.2.5 Buffer memory

This section introduces the CPU module in the FL-net module and buffer memory used for handling its data.

(1) Applications of the buffer memory
The buffer memory is comprised of an area for use by the user and a system area as shown below.

    (a) Area for use by user

        1) This is the area other than the system area shown below.

        2) It has the following areas: area for setting the various parameters for initialization processing or data communication, area for data communication and an area for storing data about the communication status or communication errors.

        3) For reading from and writing to the area for use by user, refer to the corresponding section.

    (b) System area
The is the area used by the FL-net module.

Important

Never write data to the "System Area" of the buffer memory for the FL-net module. If any data are written to the "System Area", the programmable controller system will malfunction.

---

(2) Buffer memory assignment

The buffer memory is comprised of 1 address 16 bits.
The following is the overall structure of the buffer memory.

<Bit structure diagram>

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

Table 3.4 shows the buffer memory list.

Table 3.4 Buffer memory list

Address Decimal (Hexadecimal)	Item	Description
0 to 127 (0 to 7FH)	Local node network parameter area (128 words)	Set network parameters of the local node.
128 to 2175 (80 to 87FH)	Other node network parameter area (2048 words)	Stores network parameters of the other nodes joining the network.
2176 to 2303 (880 to 8FFH)	System area (128 words)	—
2304 to 2431 (900 to 97FH)	Status data area Bit area: 2 k bits (128 words)	Stores status data bit data.
2432 to 4479 (980 to 117FH)	Status data area Word area: 2 k words (2048 words)	Stores status data word data.
4480 to 4607 (1180 to 11FFH)	System area (128 words)	—
4608 to 5119 (1200 to 13FFH)	Network parameter/join node information acquisition area (512 words)	After execution of message transmission, the network parameter/join node information read, this area stores the network parameter/join node information of the target node.
5120 to 5631 (1400 to 15FFH)	Device profile acquisition area (512 words)	After execution of message transmission, the device profile read, this area stores the device profile data of the target node.
5632 to 6143 (1600 to 17FFH)	Log information acquisition area (512 words)	After execution of message transmission, the log information read, this area stores the log information of the target node.
6144 to 7167 (1800 to 1BFFH)	System area (1024 words)	—
7168 to 7679 (1C00 to 1DFFH)	Cyclic data area Area1: 8 k bits (512 words)	Set bit cyclic data of the local node. Stores bit cyclic data of the other nodes.
7680 to 8191 (1E00 to 1FFFH)	System area (512 words)	—
8192 to 16383 (2000 to 3FFFH)	Cyclic data area Area 2: 8 k words (8192 words)	Set word cyclic data of the local node. Stores word cyclic data of the other nodes.
16384 to 24575 (4000 to 5FFFH)	System area (8192 words)	—
24576 to 25599 (6000 to 63FFH)	Message data Send area (1024 words)	Set send data for transparent type message transmission.
25600 to 26623 (6400 to 67FFH)	Message data Receiving area (1024 words)	Stores data received by transparent type message transmission.
26624 to 32767 (6800 to 7FFFH)	System area (6144 words)	—

(3) Details of buffer memory

This section explains the details of the buffer memory.

(a) Local node network parameter area (Address: 0 to 7FH)

Set network parameters of the local node.

> **POINT**
>
> (1) The IP address of the FL-net module is set in GX Developer's intelligent function module switch setting. (Refer to Section 6.3.2 (2).)
>
> (2) For the local node network parameter setting other than the above, refer to the following:
>
> • When using the initial setting of GX Configurator-FL: Section 6.4.8
>
> • When setting on the sequence program: Section 6.5.1

Address	Description
0 to 4H	Node name (Equipment name)
5 to 6H	IP address
7H	System area
8H	Area 1 first address
9H	Area 1 size
AH	Area 2 first address
BH	Area 2 size
CH	Token monitoring time out time
DH	Minimum permissible frame interval
EH	Message data unit selection
F to 7FH	System area

[1] Node name (Equipment name)

Sets node name (Equipment name)

• Setting range : Optional data

• Default : No setting

[2] IP address

Sets the IP address (32 bit) of the FL-net module.

• Setting range : 0 · · · GX Developer's intelligent function module switch setting (＊1) is valid

: Other than 0 · · · Sets 32 bit logic address (＊2)

• Default: Intelligent function module switch setting or "192.168.250.1"

＊1: Refer to Section 6.3.2.(2) for details about intelligent function module switch setting.

＊2: Set the IP address as shown below.

When the IP address is "192.168.250.2"

	250(FAH)	2(02H)
5H	FAH	02H
6H	C0H	A8H
	192(C0H)	168(A8H)
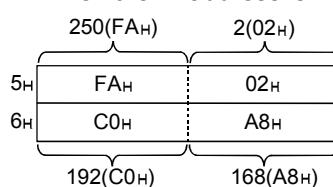
> **POINT**
>
> There will be double intelligent function module switch settings in relation to the IP address, but the value that has been set in the network parameter area will become the enabled IP address for the FL-net module.

[3] Area 1 first address

The first address of the local node common memory area 1 (bit area) is set in this area.

• Setting range: 0 to 1FFH · · · Set an offset value of the cyclic data area (Area 1) (Address: 1C00 to 1DFFH) in the buffer memory.

• Default : No setting

[4] Area 1 size

The size of the local node common memory area 1 (bit area) is set in this area. Set the area 1 size in units of one word (16 bits).

• Setting range : 0 to 200H (1 word units)
  (Set "2H" when specifying the size for 32 bits.)

• Default : No setting

[5] Area 2 first address

The first address of the local node common memory area 2 (word area) is set in this area.

• Setting range: 0 to 1FFFH · · · Set an offset value of the cyclic data area (Area 2) (Address: 2000 to 3FFFH) in the buffer memory.

• Default : No setting

[6] Area 2 size

The size of the local node common memory area 2 (word area) is set in this area.

• Setting range : 0 to 2000H (1 word units)

• Default : No setting

(Example) Setting example for common memory area 1 (bit area) and area 2 (word area) of the local node (When the local node is node 3)
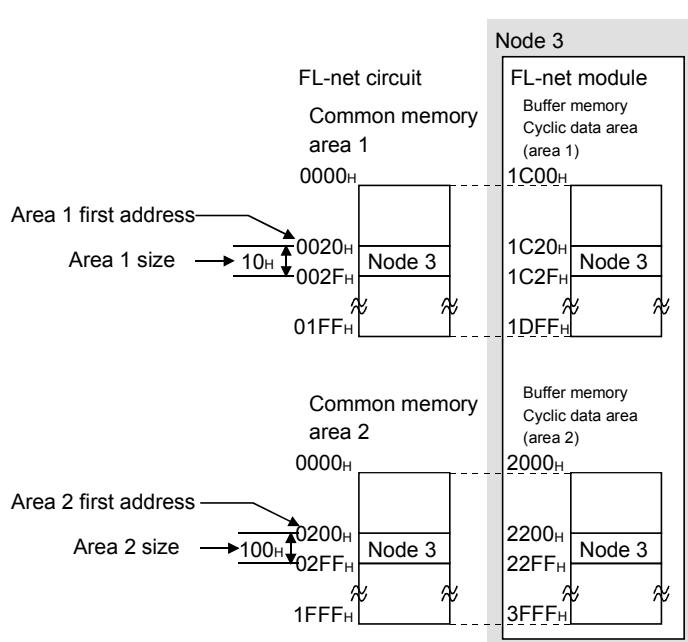
[7] Token monitoring time out time
Sets the monitoring time from the local node address token receive signal to the next node token transfer.
(If the token is held by another node, it monitors the time up to the release of the token by the node holding the token.)
• Setting range : 1 to 255 (1 ms units)
• Default : 50

[8] Minimum permissible frame interval
Sets the time from local node address token receive signal to the number of frames until local node sends.
In addition, it can also be used for message sending or frame interval time for frame division.
• Setting range : 0 to 50 (100 μ s units)
• Default : 0

[9] Message data unit selection
Sets the unit for when message data is handled.
• Setting range : 0 · · · Word unit
: 1 · · · Byte unit
• Default: 0

Important

Never write data to the "System Area" of the buffer memory for the FL-net module. If writing of data is performed to the "System Area", the programmable controller system will malfunction.

POINT

Because this area is also used when the GX Configurator-FL is used, it can be operated by sequence program settings if there is conflict with the sequence program.

(b) Other node network parameter area (address: 80 to 87FH)
Stores network parameters of the other nodes joining the network.

80H	Area 1 first address	
81H	Area 1 size	
82H	Area 2 first address	
83H	Area 2 size	Node number 1 area
84H	Token monitoring time out time	(8 words)
85H	Minimum permissible frame interval	
86H	Refresh cycle permissible time / RCT setting value	
87H	Upper layer - link status	
88 to 8FH	Same as node number 1 area	Node number 2 area (8 words)
to	to	
868 to 86FH	Same as node number 1 area	Node number 254 area (8 words)
870 to 87FH	System area	

POINT

The following settings have the same data format as the settings shown in "(a)
Local node network parameter area (3) to (8): "Area 1 first address", " Area 1 size",
"Area 2 first address", " Area 2 size", "Token monitoring time out time" and
"Minimum permissible frame interval".

---

[1] Refresh cycle permissible time / RCT setting value
Stores the refresh cycle permissible time (value of 120 % of 1 cycle).

[2] Upper layer - link status
Stores the status of the upper layer (CPU module) and link status.
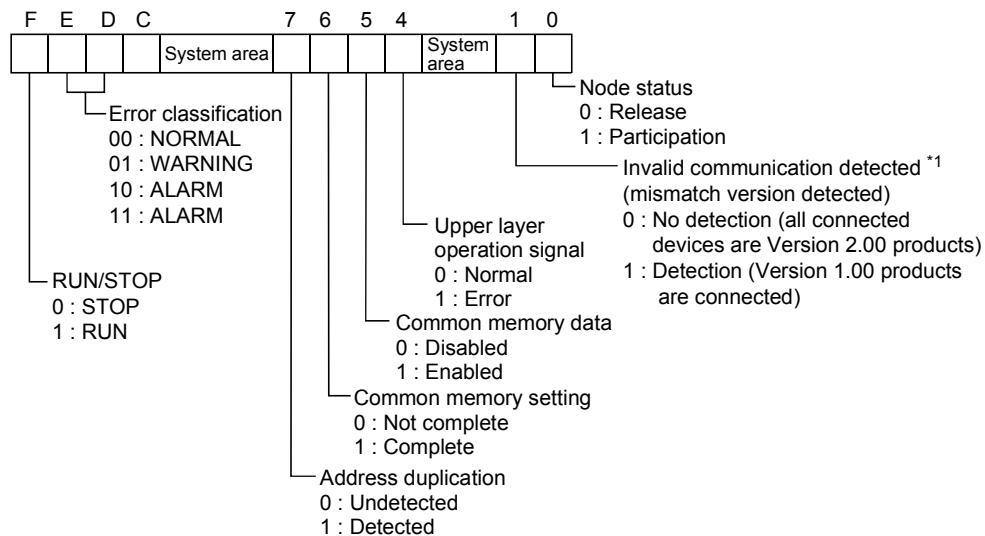
＊1: For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2, this is the system area.

(c) Status data area (Address: 900 to 117F$_H$)

Refer to Section 3.2.6 for details about the status data.

1) Status bit area (Address: 0900 to 097F$_H$)

Stores the status data bit data.

900 to 902$_H$	900 · · · b0 to 902 · · · bF CPU module → FL-net module	Write area (48 bits)
903 to 97F$_H$	903 · · · b3 to 97F · · · bF CPU module ← FL-net module	Read area (2000 bits)

<Structure diagram>
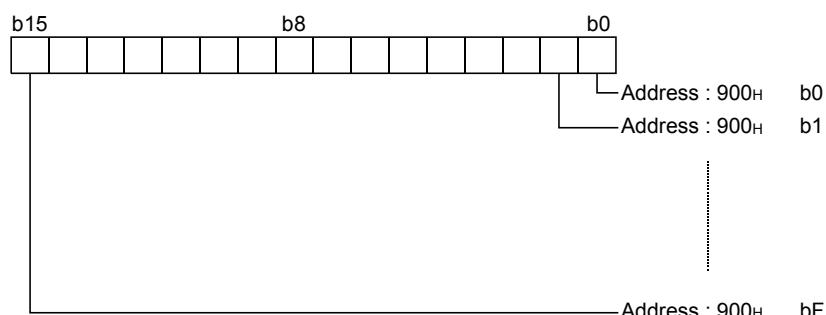
2) Status word area (Address: 0980 to 117F$_H$)

Stores the status data word data.

980 to 9AF$_H$	980 to 9AF CPU module → FL-net module	Write area (48 words)
9B0 to 117F$_H$	9B0 to 117F CPU module ← FL-net module	Read area (2000 words)

<Structure diagram>
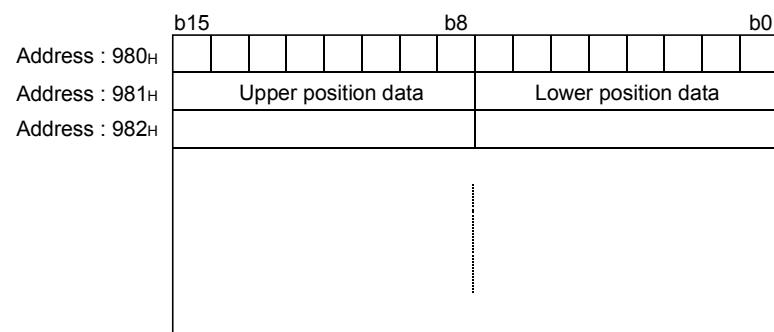
(d) Network parameter/join node information acquisition area (Address: 1200 to 13FFH)

After execution of message transmission, the network parameter/join node information read, this area stores the network parameter/join node information of the target node.

For the message transmission, the network parameter/join node information read, refer to Section 6.5.3 (1).

POINT
Switching of network parameter/join node information is determined by buffer memory address 983H · · · b15. (See Section 3.2.6 (2)) 0: Network parameter data reading 1: Join node data reading

---

		Network parameter	Join node
1200 to 1204H	Node name (Equipment name)	○	○
1205 to 1209H	Vendor name	○	○
120A to 120EH	Manufacturer model	○	○
120FH	Area 1 first address	○	○
1210H	Area 1 size	○	○
1211H	Area 2 first address	○	○
1212H	Area 2 size	○	○
1213H	Token monitoring time out time	○	○
1214H	Minimum permissible frame interval	○	○
1215H	Link status	○	○
1216H	Protocol version	○	—
1217H	Upper layer status	○	○
1218H	Refresh cycle permissible time / RCT setting value	○	○
1219H	Current value of refresh cycle	○	—
121AH	Maximum value of refresh cycle	○	—
121BH	Minimum value of refresh cycle	○	—
121C to 13FFH	System area	—	—

○ : Stored   — : Not stored

[1] Node name (Equipment name)
Stores the node name (equipment name) of the node to be the target.

[2] Vendor name
Stores the vendor name of the node to be the target in ASCII characters.
(Example) Mitsubishi Electric: MELCO

[3] Manufacturer model
Stores the manufacturer model of the node to be the target in ASCII characters.
• QJ71FL71-T-F01   : "QJFLT-F01"
• QJ71FL71-B5-F01 : "QJFLB5-F01"
• QJ71FL71-B2-F01 : "QJFLB2-F01"
• QJ71FL71-T: "QJ71FL71T "
• QJ71FL71-B5: "QJ71FL71B5"
• QJ71FL71-B2: "QJ71FL71B2"

[4] Area 1 first address, Area 1 size, Area 2 first address, Area 2 size,
Token monitoring time out time and Minimum permissible frame interval
Stores each of the settings for the node to be the target.

[5] Link status
Stores the network status of the node to be the target.

```
 7  6  5  4        0
┌──┬──┬──┬──┬────────────┐
│  │  │  │  │ System area │
└──┴──┴──┴──┴────────────┘
            └─ Upper layer operation signal
                0 : Normal
                1 : Error
         └─ Common memory data
             0 : Disabled
             1 : Enabled
      └─ Common memory setting
          0 : Not finished
          1 : Finished
   └─ Address duplication
       0 : Not detected
       1 : Detected
```
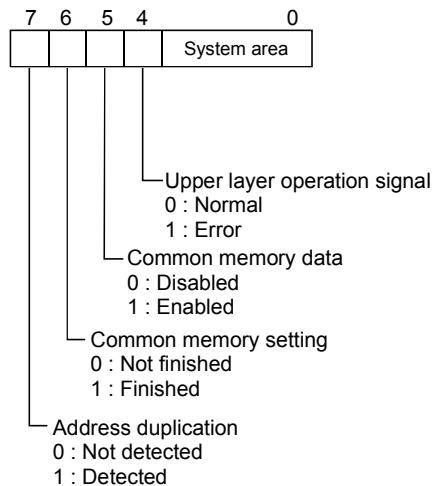
[6] Protocol version
Stores the protocol version for FL-net (OPCN-2).
• Protocol version: 0080H fixed

[7] Upper layer status
Stores the status of the upper layer (CPU module) of the node to be the target.

```
 F  E  D  C        0
┌──┬──┬──┬──┬────────────┐
│  │  │  │  │ Error code  │
└──┴──┴──┴──┴────────────┘
         └─ Error classification
             00 : NORMAL
             01 : WARNING
             10 : ALARM
             11 : ALARM
   └─ RUN/STOP
       0 : STOP
       1 : RUN
```
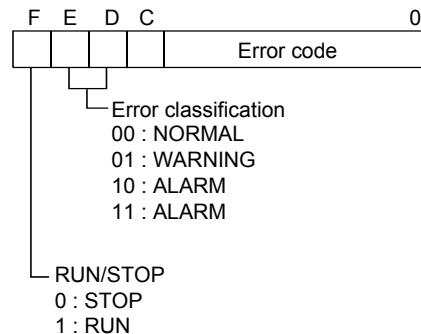
[8] Refresh cycle permissible time / RCT setting value
Stores the refresh cycle permissible time (value of 120 % of 1 cycle).

[9] Refresh cycle current value, maximum value and minimum value
Stores the measured value for one cycle of the node to be the target.

(e) Device profile acquisition area (Address: 1400 to 15FF$_H$)
   After execution of message transmission, the device profile read, this area
   stores the device profile data of the target node.
   For the message transmission, the device profile read, refer to Section
   6.5.3 (2).
   Refer to "Appendix 10 – Profile Supplement".

Parameter name		Name characters		Data type	Parameter contents	
		Length	Characters	[Type]	Length	Characters
SysPara	Device profile common specification version	6	"COMVER"	INTEGER	1	1
	System parameter identification characters	2	"ID"	PrintableString	7	"SYSPARA"
	System parameter revision number	3	REV"	INTEGER	1	0
	System parameter revision date	7	"REVDATE"	[INTEGER], 2, (0001-9999) [INTEGER], 1, (01-12) [INTEGER], 1, (01-31)	2 1 1	2003 7 1
	Device category	10	"DVCATEGORY"	PrintableString	3	"PLC"
	Vendor name	6	"VENDOR"	PrintableString	10	"MELCO"
	Device model name	7	"DVMODEL"	PrintableString	10	"QJFLT-F01" (*[1]) "QJFLB5-F01" (*[2]) "QJFLB2-F01" (*[3]) "QJ71FL71T" (*[4]) "QJ71FL71B5" (*[5]) "QJ71FL71B2" (*[6])

*1: QJ71FL71-T-F01
*2: QJ71FL71-B5-F01
*3: QJ71FL71-B2-F01
*4: QJ71FL71-T
*5: QJ71FL71-B5
*6: QJ71FL71-B2

(f) Log information acquisition area (Address: 1600 to 17FFH)
After execution of message transmission, the log information read, this area
stores the log information of the target node.
For the message transmission, the log information read, refer to Section
6.5.3 (3).

1600 to 1617H	Send and receive	(24 words)
1618 to 162FH	Frame types	(24 words)
1630 to 1647H	Cyclic transmission	(24 words)
1648 to 165FH	Message transmission	(24 words)
1660 to 1677H	ACK related	(24 words)
1678 to 168FH	Token related	(24 words)
1690 to 16A7H	Status 1	(24 words)
16A8 to 16BFH	Status 2	(24 words)
16C0 to 17FFH	System area	(320 words)

1) Send and receive (Address: 1600 to 1617H)
Stores log information related to send and receive.

1600 to 1601H	Totaling socket send count
1602 to 1603H	Totaling socket send error count
1604 to 1605H	Ethernet send error count
1606 to 160BH	System area
160C to 160DH	Total receive count
160E to 160FH	Total receive error count
1610 to 1611H	Ethernet receive error count
1612 to 1617H	System area

[1] Totaling socket send count
Stores the accumulated count of sending to transmission line.

[2] Totaling socket send error count
Stores the accumulated count of send errors detected at the
transmission line.

[3] Ethernet send error count
Stores the accumulated count of send errors detected at the data
link and physical layer.

[4] Total receive count
Stores the accumulated count of receive signals to the
transmission line.

[5] Total receive error count
Stores the accumulated count of receive errors detected at the
transmission line.

[6] Ethernet receive error count
Stores the accumulated count of receive errors detected at the
data link and physical layer.

2) Frame type (Address: 1618 to 162F$_H$)
Stores the log information related to the frame types.

Address	Description
1618 to 1619$_H$	Token send count
161A to 161B$_H$	Cyclic frame send count
161C to 161D$_H$	1 : 1 message frame send count
161E to 161F$_H$	1 : n message send count
1620 to 1623$_H$	System area
1624 to 1625$_H$	Token receive count
1626 to 1627$_H$	Cyclic frame receive count
1628 to 1629$_H$	1 : 1 message frame receive count
162A to 162B$_H$	1 : n message receive count
162C to 162F$_H$	System area

[1] Token send count
Stores the accumulated count of tokens sent (token + cyclic).

[2] Cyclic frame send count
Stores the accumulated count of cyclic frames sent.

[3] 1 : 1 message frame send count
Stores the accumulated count of 1:1 message frames sent.

[4] 1 : n message send count
Stores the accumulated count of 1:n (broadcast) message frames
sent.

[5] Token receive count
Stores the accumulated count of local node address tokens (token
+ cyclic) received.

[6] Cyclic frame receive count
Stores the accumulated count of cyclic frames received.

[7] 1 : 1 message frame receive count
Stores the accumulated count of local node address 1:1 message
frames received.

[8] 1 : n message frame receive count
Stores the accumulated count of 1:n (broadcast) message frames
received.

3) Cyclic transmission (Address: 1630 to 1647H)
   Stores log information related to cyclic transmission.

Address	
1630 to 1631H	Cyclic frame receive error count
1632 to 1633H	Cyclic address size error count
1634 to 1635H	Cyclic CBN error count
1636 to 1637H	Cyclic TBN error count
1638 to 1639H	Cyclic BSIZE error count
163A to 1647H	System area

[1] Cyclic frame receive error count
    Stores the accumulated count of cyclic frame receive error detections.
[2] Cyclic address size error count
    Stores the accumulated count of address size error detections in the cyclic frame.
[3] Cyclic CBN error count
    Stores the accumulated count of CBN (block number) error detections in the cyclic frame.
[4] Cyclic TBN error count
    Stores the accumulated count of TBN (number of total blocks) error detections in the cyclic frame.
[5] Cyclic BSIZE error count
    Stores the accumulated count of BSIZE (data size including frame header) error detections in the cyclic frame.

4) Message transmission (Address:1648 to 165FH)
   Stores log information related to message transmission.

Address	
1648 to 1649H	Message transmission resend count
164A to 164BH	Message transmission resend over count
164C to 1655H	System area
1656 to 1657H	Message transmission receive error count
1658 to 1659H	Message transmission communication number error count
165A to 165BH	Message transmission resend recognition count
165C to 165FH	System area

[1] Message transmission resend count
    Stores the accumulated count of resends in the message frame.
[2] Message transmission resend over count
    Stores the accumulated count of resend over in the message frame.
[3] Message transmission receive error count
    Stores the accumulated count of receive error detections in the message frame.
[4] Message transmission communication number error count
    Stores the accumulated count of communication number error detections in the message frame.
[5] Message transmission resend recognition count
    Stores the accumulated count of resend recognition in the message frame.

5) ACK related (Address: 1660 to 1677H)
Stores log information related to ACK.

1660 to 1661H	ACK error count
1662 to 1663H	Serial number version error count
1664 to 1665H	Serial number error count
1666 to 1667H	Node number error count
1668 to 1669H	TCD error count
166A to 1677H	System area

[1] ACK error count
Stores the accumulated count of ACK header error detections.
[2] Serial number version error count
Stores the accumulated count of serial number version error detections (mis-match detection).
[3] Serial number error count
Stores the accumulated count of serial number error detections (non-continuous detection).
[4] Node number error count
Stores the accumulated count of node number error detections.
[5] TCD error count
Stores the accumulated count of TCD (transaction code) error detections

6) Token related (Address : 1678 to 168FH)
Stores log information related to token.

1678 to 1679H	Token multiplexing recognition count
167A to 167BH	Token destruction count
167C to 167DH	Token resend count
167E to 1683H	System area
1684 to 1685H	Token holding time out count
1686 to 1687H	Token monitoring time out count
1688 to 168FH	System area

[1] Token multiplexing recognition count
Stores the accumulated count of optional node address (including local node address) tokens detected while the token is being held.
[2] Token destruction count
Stores the accumulated count of node address tokens having a value that is less than that of local node while the token is being held.
[3] Token resend count
Stores the accumulated count of token resends.
[4] Token holding time out count
Stores the accumulated count of time out detections for token hold time out time (value that does not exceed the token monitoring time out time).
[5] Token monitoring time out count
Stores the accumulated count time out detections for token monitoring time out time.

7) Status 1 (Address:1690 to 16A7H)
Store log information related to status 1.

1690 to 1691H	Total operating time
1692 to 1693H	Frame wait status count
1694 to 1695H	Enter count
1696 to 1697H	Self-release count
1698 to 1699H	Release-by-skip count
169A to 169BH	Other node release count
169C to 16A7H	System area

[1] Total operating time
Stores the total operating time. (Unit: ms)

[2] Frame wait status count
Stores the accumulated count that frame wait status has become.

[3] Join count
Stores the accumulated count of local node joining.

[4] Self-release count
Stores the accumulated count of self release (when token holding time for local node up is generated 3 consecutive times).

[5] Release-by-skip count
Stores the accumulated count of release by skip (local node address token is pulled out 3 consecutive times).

[6] Other node release count
Stores the accumulated count of detections of other node releases.

8) Status 2 (Address:16A8 to 16BFH)
Stores log information related to status 2.

16A8 to 16B7H	Participation node list
16B9 to 16B8H	System area

[1] Participation node list
Stores the token participation status at other node tokens in bit units.

0 : Release
1 : Participation
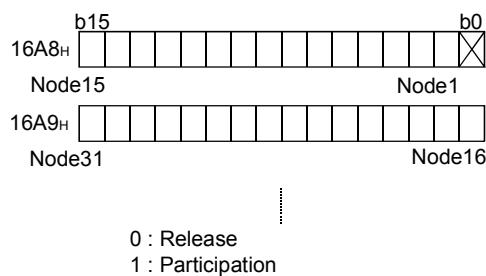
(g) Cyclic data area

The cyclic data area consists of area 1 (bit area) and area 2 (word area).

> **POINT**
>
> For the information on how to transfer data between the cyclic data area (areas 1, 2) in the buffer memory and programmable controller CPU devices, refer to the following:
> • Transfer by the auto refresh setting of GX Configurator-FL: Section 6.4.9
> • Transfer using sequence program: Section 6.5.2

1) Area 1 (Address: 1C00 to 1DFFH)

Set bit cyclic data of the local node.

Stores bit cyclic data of the other nodes.

1C00 to 1DFFH	Read/write area (8192 bits)

<Structure diagram>
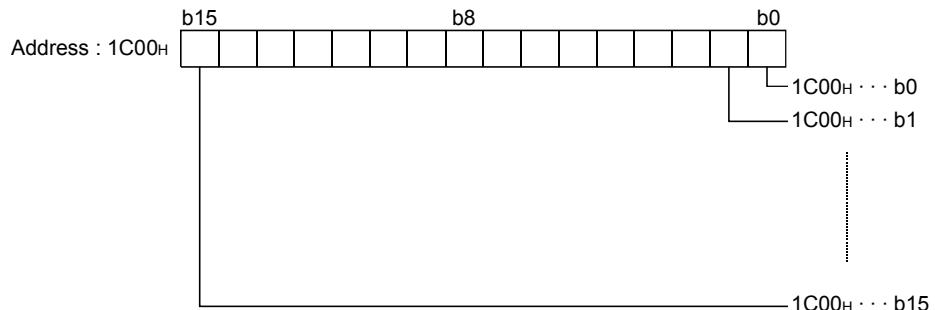
2) Area 2 (Address: 2000 to 3FFFH)

Set word cyclic data of the local node.

Stores word cyclic data of the other nodes.

2000 to 3FFFH	Read/write area (8192 words)

<Structure diagram>
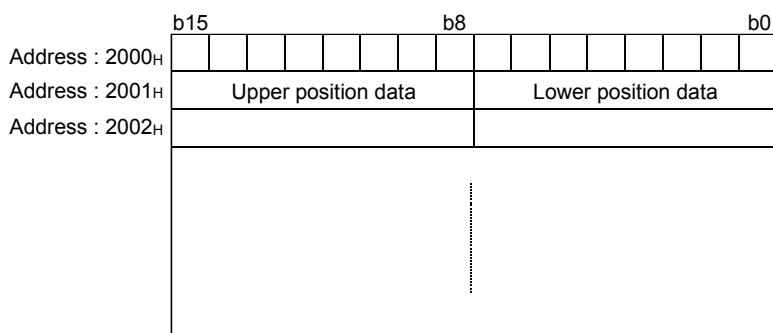
> **POINT**
>
> (1) The area allocated in the send area of the local node is the "write area" and the rest is the "read area".
>
> (2) Write the data to be transfferred to other station from host station into the "write area" which is the sending range of the local node. Do not write any data into the "read area" which is receiving range from other node. When data is written intentionally, the system may malfunction after completing the writing. Read area can be confirmed at other node network parameter area in buffer memory (address : 0080~0087FH). (Refer to Sectoin 3.2.5(3)(b))

(h) Message data area
The message data area sets and stores the data related to transparent type message transmissions.
For the transparent type message transmission, refer to Section 6.5.3 (5).
The message data area has a send area and a receive area.

1) Send area (Address: 6000 to 63FFH)
Data such as the target node number and message data to be transmitted is set in the send area.

Address	Content
6000H	Target node number
6001H	Transaction code
6002H	Send data size (Byte/word length)
6003 to 6202H	Send data area (512 words)
6203 to 63FFH	System area
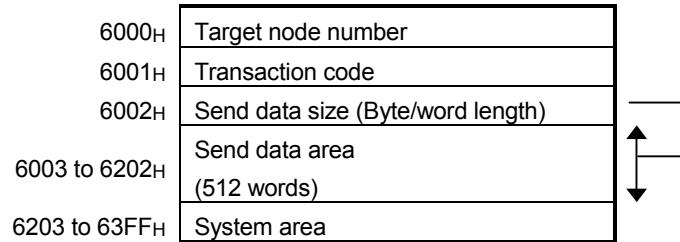
[1] Target node number
• 0 : Use prohibited
• 1 to 254 : Target node number
• 255 : All stations (Global)
• 256 and more : Use prohibited

[2] Transaction code
Sets the transaction code.
Refer to Section 6.2.8. (4) for details about the transaction code.

[3] Send data size
Sets the message data size to be sent.
The data unit (byte or word) is selected in "Message Data Unit Select" of the network parameter.
• Word unit: 0 to 512
• Byte unit: 0 to 1024

[4] Send data area
Sets the size of the message data to be sent (up to 512 words or 1024 bytes).

2) Receive area (Address: 6400 to 67FF$_H$)
The send source node number, receive message data and other data is stored in the receive area.

Address	
6400$_H$	Send source node number
6401$_H$	Transaction code
6402$_H$	Receive data size (byte/word length)
6403 to 6602$_H$	Receive data area (512 words)
6603 to 67FF$_H$	System area
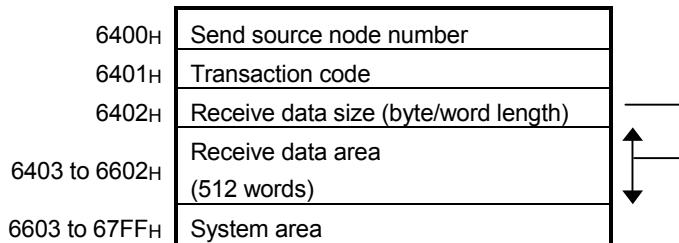
[1] Send source node number
Stores the node number for the node to be the send source.
If all stations, arrange so that there is no answer.
• 1 to 254: Send source node number
• 255: All stations (Global)

[2] Transaction code
Stores the transaction codes for received message data.
Refer to Section 6.2.8. (4) for details about the transaction code.

[3] Receive data size
Stores the size of the message data that has been received.
The data unit (byte or word) is selected in "Message Data Unit Select" of the network parameter.
• Word unit: 0 to 512
• Byte unit: 0 to 1024

[4] Receive data area
Stores the size of the message data received (up to 512 words or 1024 bytes).

REMARK

When the data unit designation for send and receive is different
The follow explains when the send side is in byte units and the receive side is in word units.
When the send data number is an odd number, a zero (0) is stored at the end of the data stored in the receive buffer area.

Send buffer area

2	1
4	3
0	5

Byte designation (5 bytes)

Data number = odd

Receive buffer area

2	1
4	3
0	5

Word designation (3 words)
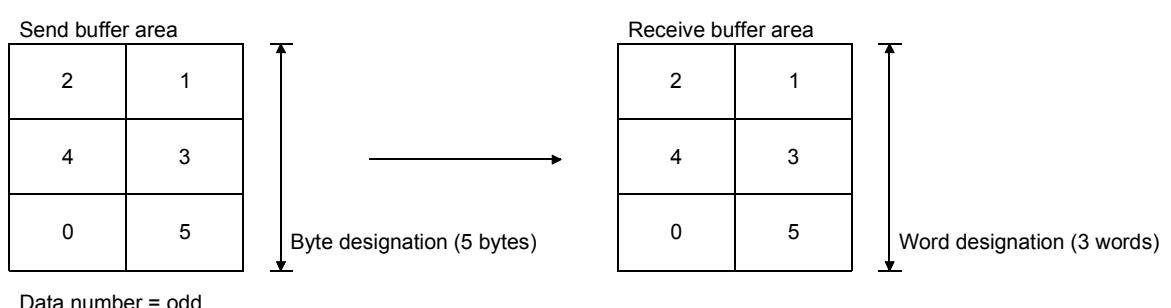
3.2.6 Status data details

This section explains the details about status data.
Status data stores the following data.

1) Status bit

a) Specified information area "CPU $\rightarrow$ FL-net (OPCN-2)"

b) Local node information area "FL-net (OPCN-2) $\rightarrow$ CPU"

2) Status word

a) Specified information area "CPU $\rightarrow$ FL-net (OPCN-2)"

b) Message information area "CPU $\rightarrow$ FL-net (OPCN-2)"

c) Local node information area "FL-net (OPCN-2) $\rightarrow$ CPU"

d) Other node information area "FL-net (OPCN-2) $\rightarrow$ CPU"

e) Log information area "FL-net (OPCN-2) $\rightarrow$ CPU"

f) Message information area "FL-net (OPCN-2) $\rightarrow$ CPU"

(1) Status bit details

This section explains the status data bit area.
The notation method for the buffer memory address is shown below.
(Buffer memory address indication)

900H $\cdots$ b0
 └── Bit number (Address 900H of bit 0)
 └────── Buffer memory address (Address 900H)
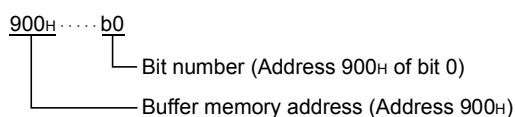
Operation mode shows the valid/invalid for each mode of the online/offline.

(a) Specified information area "CPU $\rightarrow$ FL-net (OPCN-2)"

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
900H $\cdot\cdot\cdot$ b9	Log information clear	Indicates clearing of log information in buffer memory (Address:A80H to B38H) ($*^1$) 0: No clear instruction 1: Clear instruction	○	—

○ : Valid — : Invalid

$*$1: Clear is executed during on status.

(b)   Local node information area "FL-net (OPCN-2) → CPU"

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
904H · · · b3	Operation data	Indicates node switch of module. 0: On 1: Other than On	○	—
904H · · · b6	Setting data	Indicates node number switch of module. 0: Normal 1: Setting error (node number=0, 256 or more, or mode = other than test, online)	○	○
904H · · · b7	Module type	Indicates module type ∗1 0: QJ71FL71-T-F01 (10BASE-T/100BASE-TX), QJ71FL71-B5-F01 (10BASE5), QJ71FL71-T (10BASE-T), QJ71FL71-B5 (10BASE5) 1: QJ71FL71-B2-F01 (10BASE2), QJ71FL71-B2 (10BASE2)	○	○
904H · · · b8	Local node communication status	Indicates local node communication (token participation) status. 0: Normal 1: Error	○	—
904H · · · bA	Local node CPU status 1	Indicates local node Qn(H) CPU self-diagnosis result. 0: Normal 1: Warning	○	—
904H · · · bB	Local node CPU status 2	Indicates local node Qn(H) CPU self-diagnosis result. 0: Normal 1: Alarm	○	—
905H · · · b0	Node initialization status	Indicates the initialization completion status of the FL-net module. 0: Completed 1: Not completed	○	—
905H · · · b1	Network parameter setting status	Indicates network parameter setting status from Qn(H) CPU. 0: Setting complete 1: Setting not complete	○	—
905H · · · b2	Network parameter data	Indicates receive network parameter data. 0: Normal 1: Setting error	○	—
905H · · · b8	Receive signal wait status (waiting for network participation)	Indicates local node receive signal wait status. 0: No receive signal wait 1: Receive signal wait	○	—
905H · · · b9	Token monitoring time out error status	Indicates token transmission monitoring time out error status. 0: Normal 1: Token monitoring time out error	○	—
905H · · · bA	Node number multiplexing detection status	Indicates whether or not local node number duplicates other node number. 0: Normal 1: Duplicate node number detected	○	—
905H · · · bB	Area 1 address multiplexing detection signal	Indicates whether or not local node common memory area 1 (bit area) duplicates other node common memory area. 0: Normal 1: Duplicate address detected	○	—
905H · · · bC	Area 2 address multiplexing detection signal	Indicates whether or not local node common memory area 2 (word area) duplicates other node common memory area. 0: Normal 1: Duplicate address detected	○	—
905H · · · bD	Invalid communication detected status	Indicates the local node communication status during data linking participation. (QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01 only) 0: Communication valid (the same frame received) 1: Communication invalid (different frame received)	○	—
90BH · · · bF	Message transmission data	Indicates whether a message transmission error is present or not. 0: No error 1: Error occurred	○	—

○ : Valid　— : Invalid

∗1: When making module recognition in a sequence program, etc., use the 9C7H data.

(2) Status word details

This section explains the status data word range.

(a) Specified information area "CPU → FL-net (OPCN-2)"

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
983H	Other node number setting for network parameter use	Indicates node number if reading network parameter/join node information for other node. ($*1$) 1 to 254: Node number b15 (Top bit) 0: Network parameter data read 1: join node data read	○	—
984H	Other node number setting for device profile	Indicates node number if reading device profile for other node. 1 to 254: Node number	○	—
985H	Other node number setting (1) for log information	Indicates to node number if clearing log information for other node. 1 to 254: Node number	○	—
986H	Other node number setting (2) for log information	Indicates to node number if clearing log information for other node. 1 to 254: Node number	○	—

○ : Valid — : Invalid

$*1$: The points of difference between network parameter information read and join node information read are as follows.

Network parameter information read: Message issued and acquired by target node and responds.

Join node information read: Responds based on data in cyclic frame.

(b) Message information area "CPU → FL-net (OPCN-2)"

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
9A0H	Response message classification	Indicates the message classification (status) of message transmission using message send area. 00H: Normal message response or request message. 01H: Error message response 02H: Not supported ($*1$)	○	—
9A1H	Virtual address space data size	Indicates data size ($*2$) when using virtual address space in the transmission of message used for message send area. Range: 0H (Does not use virtual address space) 1H to FFFFH	○	—
9A2H to 9A3H	Virtual address space first address	Indicates the first address (32 bits) when using virtual address space in the transmission of message used for message send area. Range: 0H to FFFFFFFFH	○	—

○ : Valid — : Invalid

$*1$: This is the responding message when own system receives message it does not support.

$*2$: The virtual address space data size is dependent on the transaction code without relation to the message data unit selection made in the network parameter settings.

(c) Local node information area "FL-net (OPCN-2) → CPU"

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
9C2H	Node number	Indicates the node number of the FL-net module. 1 to 249: Node number	○	○
9C3H	Mode switch	Indicates the FL-net module mode switch status. 0: On line (10Mbps, half duplex) 1: Off line 2: Loopback test 3: Hardware test 4: On line (Auto negotiation) (The QJ71FL71-T-F01 only) Other: Setting error	○	○
9C4H to 9C5H	IP address	Indicates FL-net module address status. b31 b0 | 1 | 1 | 1 | Network : 21 bits | Host : 8 bits | 9C5H 9C4H	○	○
9C6H	Intelligent function module switch setting status	Indicates setting status of switches. 0: Normal 1 to: Error code	○	○
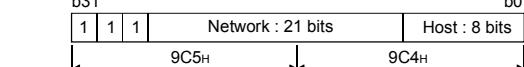
9C7H	Module recognition	Indicates whether the local node module has an Ethernet interface.
		(100BASE-TX is available for the QJ71FL71-T-F01 only.)
		b15 b0
		| 1 | 1 | | 0 : No, 1 : Yes
		                10BASE2
		                10BASE5
		                10BASE-T/100BASE-TX
			○	○
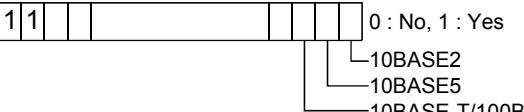
9C8H	Local node communication status	Indicates data link (cyclic transmission) of local node. 0: During data link 3: Disconnecting (Network parameter error detection) 4: Disconnecting (Token monitoring time out) 5: Disconnecting (Node number multiplexing detection) 6: Disconnecting (Receive wait status) 7: Disconnecting (invalid communication detected) (The QJ71FL71-T-F01, QJ71FL71-B5-F01 and QJ71FL71-B2-F01 only) FE: Initializing FFF: Resetting	○	—
9C9H	FL-net (OPCN-2) protocol version	Indicates FL-net (OPCN-2) protocol version. Example: The version is 2.00. | 0 | 2 ● 0 | 0 | H	○	○
9CAH	FL-net (OPCN-2) authorization version	Indicates FL-net (OPCN-2) authorization version. Example: The version is 2.00. | 4 | 2 ● 4 | 2 | H Authorization software version Authorization hardware version	○	○
9CBH	Local node CPU status	Indicates results of local node CPU self diagnosis. 0: Normal 1 to: Error code	○	—
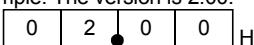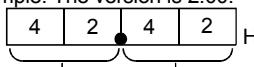
○ : Valid — : Invalid

(Continued from previous page)

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
9D0H	Maximum communication node number	Indicates the maximum node number of node normally communicating (token participation).	○	—
9D2H	Network parameter setting status	Indicates the network parameter setting contents status. 0: Normal 1 to: Error code	○	—
9D3H	Network parameter read results	Indicates network parameter read results. 0: Normal 1 to: Error code	○	—
9D4H	Device profile read results	Indicates device profile read results. 0: Normal 1 to: Error code	○	—
9D5H	Log information clear results	Indicates log information a clear results. 0: Normal 1 to: Error code	○	—
9D6H	Log information read results	Indicates log information read results. 0: Normal 1 to: Error code	○	—
9D7H	Transparent message send results	Indicates transparent message send results. 0: Normal 1 to: Error code	○	—
9D8H	Token monitoring time	Indicates maximum token monitoring time for each node that has been set by the network parameters. 0: No setting 1 to 255: Setting (Unit: ms)	○	—
9D9H	Maximum permissible frame interval	Indicates maximum permissible frame intervals for each node that has been set by the network parameters. 0: No setting 1 to 50: Setting (Unit: 100μs)	○	—
9DAH	Refresh cycle permissible time / RCT setting value	Indicates refresh cycle time of 120% of value. (Unit: ms)	○	—
9DBH	Network parameter data	Stores the network parameter data. (Network parameter setting status: Enabled when 905H · · · b1 is off (0)) 15 ———————————— 0 Setting data 1 : Common memory setting - Yes 0 : Common memory setting - No Setting conditions 0 : Sequence program 1 : GX Configurator-FL	○	—
9DCH	Message unit data	Stores the unit of the data handled by the message area. 1: Word unit 2: Byte unit	○	—
9DDH	Current value refresh cycle time	Indicates refresh cycle time during data link (cyclic transmission) execution. (Unit: ms)	○	—
9DEH	Maximum value refresh cycle time	Indicates maximum refresh cycle time during data link (cyclic transmission) execution. (Unit: ms)	○	—
9DFH	Minimum value refresh cycle time	Indicates minimum refresh cycle time during data link (cyclic transmission) execution. (Unit: ms)	○	—
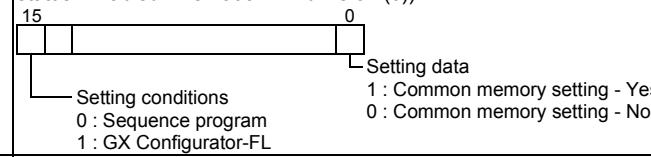
○ : Valid — : Invalid

POINT
When the error code is in 4000, refer to the error code list for the CPU module.

(d) Other node information area "FL-net (OPCN-2) → CPU "

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
9E0H to 9EFH	Participation node list	Indicates the token participation status at the other node in bits. 0: Participation 1: Release	○	—
9F0H to 9FFH	Other node network parameter setting status	Indicates the network parameter setting status at the other node in bits. (*1) 0: Setting 1: No setting	○	—
A00H to A0FH	Other node CPU execution status	Indicates the execution status of Qn (H) CPU, etc., at the other node. (*1) 0: RUN status (RUN,STEP_RUN) 1: STOP status (STOP, PAUSE)	○	—
A10H to A1FH	Other node CPU operation status (Low level error) *2	Indicates the results of self-diagnosis of Qn (H) CPU, etc., at the other node. (*1) 0: Normal 1: Warning	○	—
A20H to A2FH	Other node CPU operation status (Medium, high level errors) *3	Indicates the results of self-diagnosis of Qn (H) CPU, etc., at the other node. (*1) 0: Normal 1: Alarm	○	—

○ : Valid — : Invalid

*1: Participation node only is target.
*2: Low level error is a error during which the CPU module continues to operate.
*3: Medium and high level errors are errors which stop the operation of the CPU module.

(e)   Log information area "FL-net (OPCN-2) $\rightarrow$ CPU"

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
A80H to A81H	Totaling socket sending count	Indicates the accumulated count of sending to transmission line.	○	—
A82H to A83H	Totaling socket send error count	Indicates the accumulated count of send errors detected at the transmission line.	○	—
A84H to A85H	Ethernet send error count	Indicates the accumulated count of send errors detected at the data link and physical layer.	○	—
A8CH to A8DH	Total receive count	Indicates the accumulated count of receive signals to the transmission line.	○	—
A8EH to A8FH	Total receive error count	Indicates the accumulated count of receive errors detected at the transmission line.	○	—
A90H to A91H	Ethernet receive error count	Indicates the accumulated count of receive errors detected at the data link and physical layer.	○	—
A98H to A99H	Token send count	Indicates the accumulated count of tokens sent (token + cyclic).	○	—
A9AH to A9BH	Cyclic frame send count	Indicates the accumulated count of cyclic frames sent.	○	—
A9CH to A9DH	1:1 message frame send count	Indicates the accumulated count of 1:1 message frames sent.	○	—
A9EH to A9FH	1:n message frame send count	Indicates the accumulated count of 1:n (broadcast) message frames sent.	○	—
AA4H to AA5H	Token receive count	Indicates the accumulated count of local node address tokens (token + cyclic) received.	○	—
AA6H to AA7H	Cyclic frame receive count	Indicates the accumulated count of cyclic frames received.	○	—
AA8H to AA9H	1:1 message frame receive count	Indicates the accumulated count of local node address 1:1 message frames received.	○	—
AAAH to AABH	1:n message frame receive count	Indicates the accumulated count of 1:n (broadcast) message frames received.	○	—
AB0H to AB1H	Cyclic frame receive error count	Indicates the accumulated count of cyclic frame receive error detection.	○	—
AB2H to AB3H	Cyclic address size error count	Indicates the accumulated count of address size error detection in the cyclic frame.	○	—
AB4H to AB5H	Cyclic CBN error count	Indicates the accumulated count of CBN (block number) error detection in the cyclic frame.	○	—
AB6H to AB7H	Cyclic TBN error count	Indicates the accumulated count of TBN (number of total blocks) error detection in the cyclic frame.	○	—
AB8H to AB9H	Cyclic BSIZE error count	Indicates the accumulated count of BSIZE (data size including frame header) error detection in the cyclic frame.	○	—

○ : Valid — : Invalid

(Continued from previous page)

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
AC8H to AC9H	Message transmission resend count	Indicates the accumulated count of resends in the message frame.	○	—
ACAH to ACBH	Message transmission resend over count	Indicates the accumulated count of resend over in the message frame.	○	—
AD6H to AD7H	Message transmission receive error count	Indicates the accumulated count of receive error detections in the message frame.	○	—
AD8H to AD9H	Message transmission communication number error count	Indicates the accumulated count of communication number error detections in the message frame.	○	—
ADAH to ADBH	Message transmission resend recognition count	Indicates the accumulated count of resend recognition in the message frame.	○	—
AE0H to AE1H	ACK error count	Indicates the accumulated count of ACK header error detections.	○	—
AE2H to AE3H	Serial number version error count	Indicates the accumulated count of serial number version ($*^1$) error detections (mis-match detection).	○	—
AE4H to AE5H	Serial number error count	Indicates the accumulated count of serial number ($*^1$) error detections (non-continuous detection).	○	—
AE6H to AE7H	Node number error count	Indicates the accumulated count of node number error detections.	○	—
AE8H to AE9H	TCD error count	Indicates the accumulated count of TCD (transaction code) error detections.	○	—
AF8H to AF9H	Token multiplexing recognition count	Indicates the accumulated count of optional node address (including local node address) tokens detected while the token is being held.	○	—
AFAH to AFBH	Token destruction count	Indicates the accumulated count of node address tokens having a value that is less than that of local node while the token is being held.	○	—
AFCH to AFDH	Token resend count	Indicates the accumulated count of token resends.	○	—
B04H to B05H	Token holding time out count	Indicates the accumulated count of time out detections for token holding time out time (value that does not exceed the token monitoring time out time).	○	—
B06H to B07H	Token monitoring time out count	Indicates the accumulated count time out detections for token monitoring time out time.	○	—
B10H to B11H	Total operating time	Indicates the total operating time. (Unit: ms)	○	—
B12H to B13H	Frame wait status count	Indicates the accumulated count that frame wait status has become.	○	—
B14H to B15H	Participation count	Indicates the accumulated count of local node participaiton.	○	—
B16H to B17H	Self-release count	Indicates the accumulated count of self release (when token holding time for local node up is generated 3 consecutive times).	○	—

○: Valid —: Invalid

$*$1: This is message transfer frame serial numbers (serial numbers) and its start value. (serial versions)

(Continued from previous page)

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
B18H to B19H	Release-by-skip count	Indicates the accumulated count of release by skip (local node address token is pulled out 3 consecutive times).	○	—
B1AH to B1BH	Other node release count	Indicates the accumulated count of detections of other node releases.	○	—
B28H to B37H	Participation node list	Indicates the token participation status at the other node in bits. b15 ─ B28H ─ b0 Node15 ─ Node1 B29H Node31 ─ Node16 0: Release 1: Participation	○	—
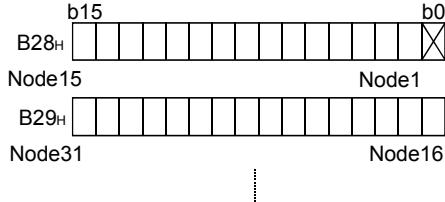
B7AH to B7BH	Auto negotiation count	• For the QJ71FL71-T-F01
		  Indicates the number of auto negociations occurred.
		• For other than the QJ71FL71-T-F01
		  Fixed to 0.
			○	—

○ : Valid — : Invalid

(f)　Message data area "FL-net (OPCN-2) → CPU"

Buffer memory address	Name	Description	Operating mode	
			On line	Off line
C00H	Response message classification	Stores the message classification (status) of message transmission using message send area. 00H: Normal message response or request message. 01H: Error message response 02H: Not supported ([1])	○	—
C01H	Virtual address space data size	Stores data size ([2]) when using virtual address space in the transmission of message used for message send area. Range: 0H (Does not use virtual address space) 1H to FFFFH	○	—
C02H to C03H	Virtual address space first address	Stores the first address (32 bits) when using virtual address space in the transmission of message used for message send area. Range: 0H to FFFFFFFFH	○	—
C80H to C8FH	Other node token mode (version mismatch) status	Indicates the valid/invalid status of the participation request from other node in bits. (QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01 only) b15 ─ C80H ─ b0 Node 15 ─ Node 1 C81H Node 31 ─ Node 16 0: Communication valid (the same frame received) 1: Communication invalid (different frame received) * Valid when the local node communication status (904H · · · b8) is off.	○	—
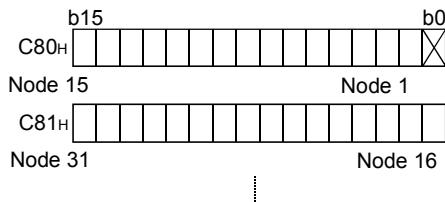
○ : Valid — : Invalid

[1]: This is the responding message when own system receives message it does not support.
[2]: The virtual address space data size is dependent on the transaction code without relation to the message data unit selection made in the network parameter settings.

3.3 Multiple CPU Systems

This section introduces the multiple CPU systems.
When using FL-net module with a multiple CPU system, the QCPU (i.e. control CPU) controlling the FL-net module is set by GX Developer.

POINT

In a multiple CPU system to which an FL-net module is mounted, only the control CPU for the FL-net module can use the FL-net module functions.

REMARK

For information about the procedure for setting multiple CPU systems, refer to Section 6.3.2 "Setting the GX Developer" and the QCPU User's Manual (Multiple CPU System).

3.4 For Use with Q12PRH/Q25PRHCPU

(1) GX Configurator-FL connection

GX Configurator-FL cannot be used when accessing the Q12PRH/Q25PRHCPU via an intelligent function module on an extension base unit from GX Developer. Connect a personal computer with a communication path indicated below.

Main base unit

Extension base unit

(GX Configurator-FL cannot be used.)

1 Direct connection to the CPU

2 Connection through an intelligent function module on the main base unit (Through Ethernet module, MELSECNET/H module, or CC-Link module)
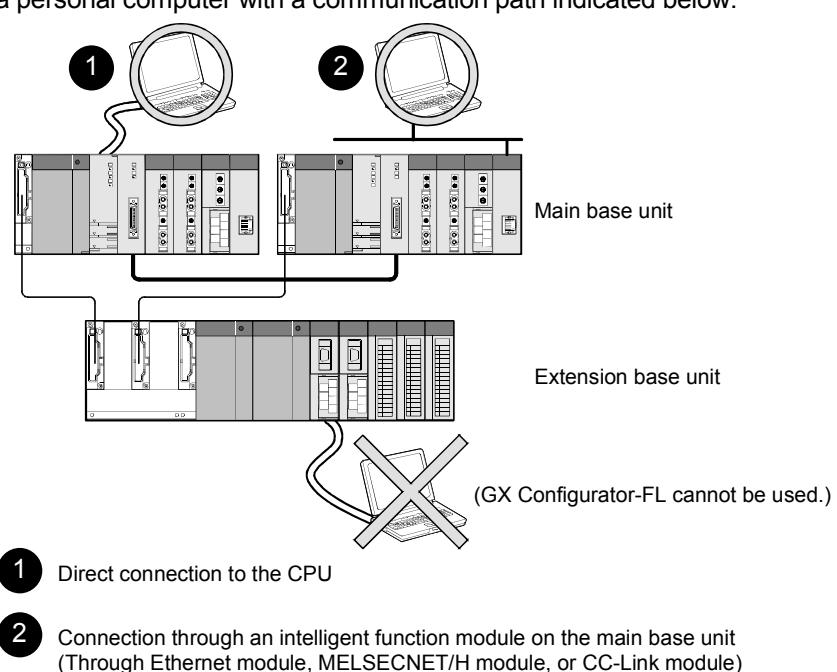
3.5 How to Check the Function Version and Software Version

(1) Checking the function version

The serial No. and function version of the FL-net modules can be confirmed on the rating plate, the front of the module and GX Developer's system monitor.

(a) Confirming the serial number on the rating plate
The rating plate is situated on the side face of the FL-net modules.
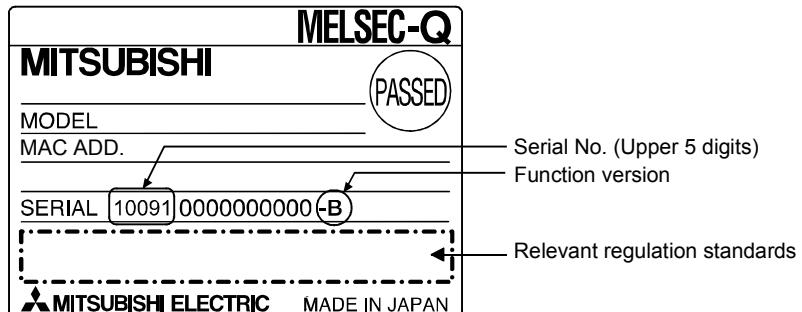
(b) Checking on the front of the module
The serial No. on the rating plate is also indicated on the front of the module (lower part).
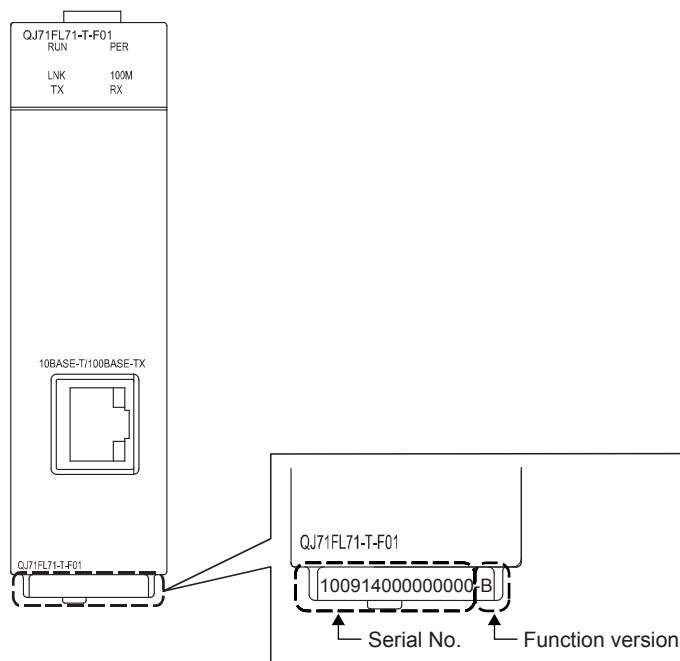
REMARK

Serial No. labelling on the front of the module was started from August in 2008. Note that, however, some of the modules manufactured around the time of change may not have the serial No. label attached.

(c) Confirming the serial number on the system monitor (Product Information List)

To display the screen for checking the serial number and function version, select [Diagnostics] → [System Monitor] and click the [Product Inf. List] button in GX Developer.

Function Version

Serial No.   Product No.

Slot	Type	Series	Model name	Points	I/O No.	Master PLC	Serial No	Ver.	Product No.
PLC	PLC	Q	Q03UDCPU	-	-	-	090920000000000	B	090911090910001-B
0-0	Intelli.	Q	QJ71FL71-T-F0:	32pt	0000	-	100914000000000	B	-
0-1	-	-	None	-	-	-	-	-	-
0-2	-	-	None	-	-	-	-	-	-

CSV file creating   Close
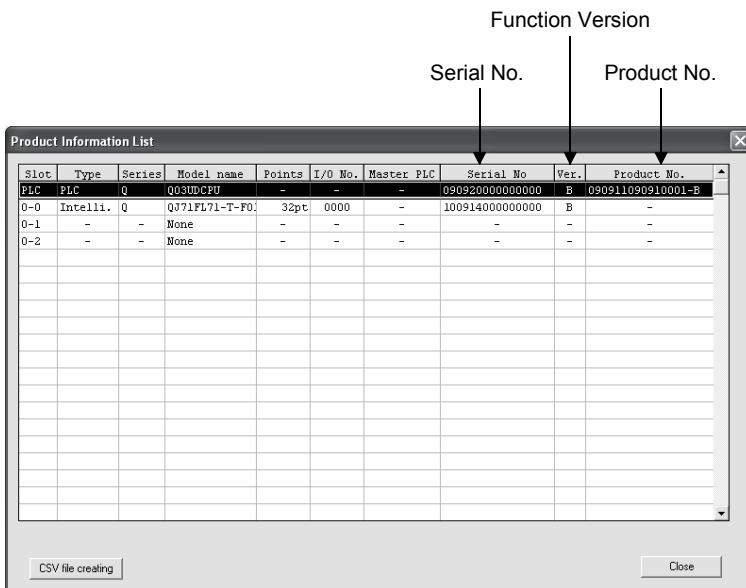
1) Production number display
Since the FL-net modules does not support the production number display, "-" is displayed.

POINT

The serial No. displayed in the Product Information List of GX Developer may be different from the one on the rating plate and the front of the module.
• The serial No. on the rating plate and the front of the module indicates the management information on the product.
• The serial No. in the product information List of GX Developer indicates the functional information on the product, which is updated when a new function is added.

(2) Checking the software version of GX Configurator-FL
The software version of GX Configurator-FL can be checked in the "Product information" dialog box, which can be opened from "Help" in GX Developer.

Software version
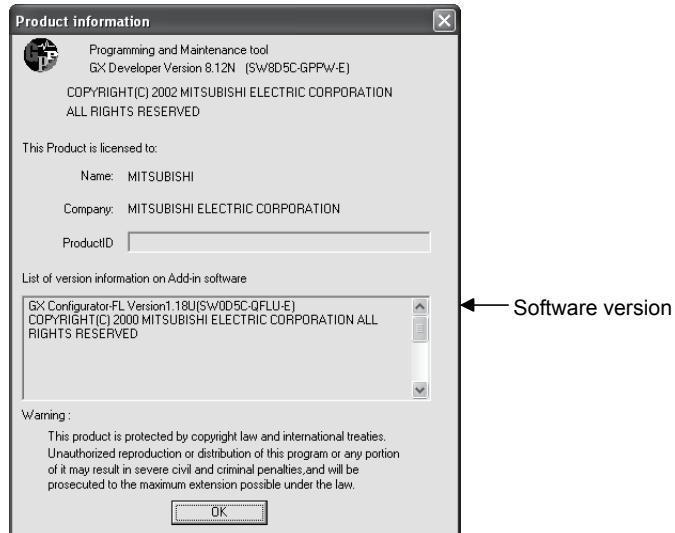
3.6 Functions and Names of Parts of FL-net Module

The following introduces the functions and names of parts of the FL-net module.

QJ71FL71-T-F01
QJ71FL71-T (*1)

QJ71FL71-B5-F01
QJ71FL71-B5 (*2)

QJ71FL71-B2-F01
QJ71FL71-B2 (*3)
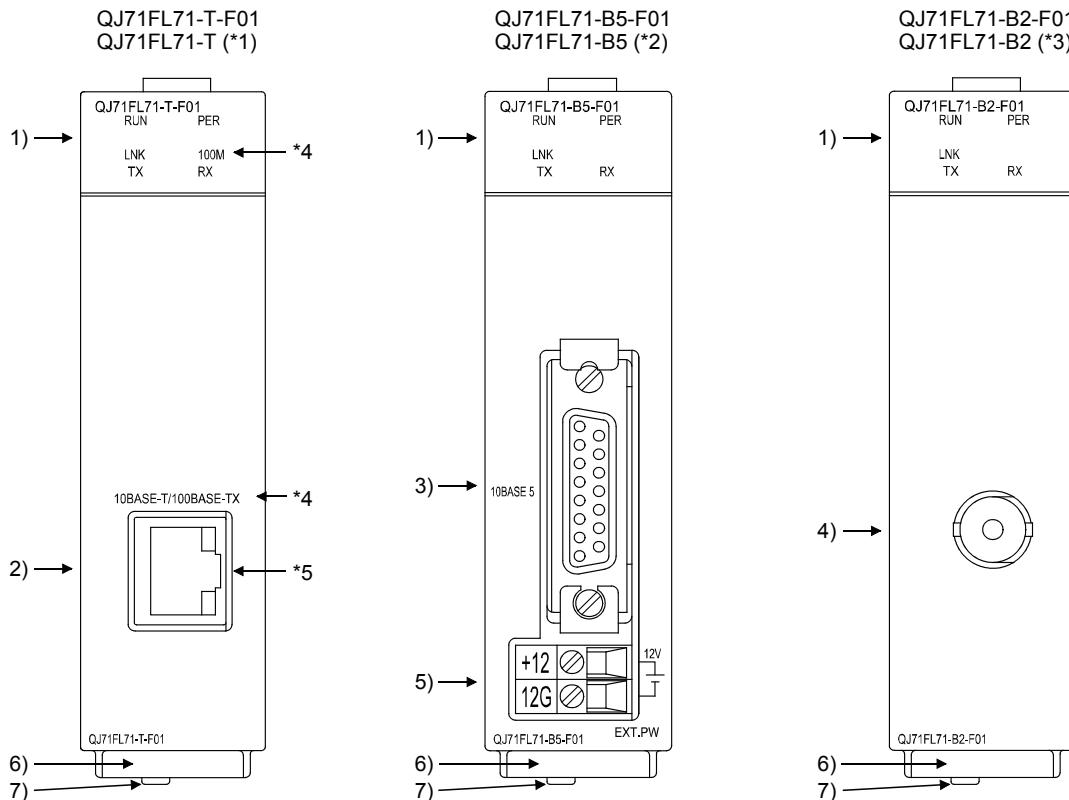
＊1: The appearance of the QJ71FL71-T is the same as that of the QJ71FL71-T-F01, except the model name part and silkscreen print.

＊2: The appearance of the QJ71FL71-B5 is the same as that of the QJ71FL71-B5-F01, except the model name part.

＊3: The appearance of the QJ71FL71-B2 is the same as that of the QJ71FL71-B2-F01, except the model name part.

＊4: The silkscreen print of 100M and 100BASE-TX is for the QJ71FL71-T-F01 only. These silkscreen 100M and 100BASE-TX are printed when the first 5 digits of the serial No. is 10011 or later.

When the serial No. (first 5 digits) is earlier than 10011, the following are printed on the module.

Although the silkscreen print is different, the LED indications and connector functionality are the same.

Present silkscreen print	Former silkscreen print
100M LED	No print
10BASE-T/100BASE-TX	10BASE-T

Since the high-speed cyclic transmission function (100Mbps) by 100BASE-TX connection has been certified by Japan Electrical Manufacture's Association (JEMA), it can be used from the first released products. (The QJ71FL71-T-F01 only)

	Name	Description
1)	LED indicator	Refer to (1) LED indications.
2)	10BASE-T/100BASE-TX connector (RJ45) ($*^5$) ($*^6$)	Connector for connecting FL-net module to 10BASE-T/100BASE-TX. (The FL-net module detects the 10BASE-T or 100BASE-TX according to the hub.)
3)	10BASE5 connector	Connector for connecting FL-net module to 10BASE5. (For connecting 10BASE5 AUI cable (transceiver cable))
4)	10BASE2 connector	Connector for connecting FL-net module to 10BASE2. (For connecting 10BASE2 coaxial cable)
5)	External power supply terminal	Terminal for supplying power to the transceiver in the connection for 10BASE5. (13.28 V to 15.75 V)
6)	Serial No. display	Label indicating the serial No. of the FL-net module
7)	Lever for mounting module	Guide for correctly mounting FL-net module to base unit.

$*$5: The LED on the connector will not light up.
The orientation of the connector is different (rotated) depending on the serial No.
$*$6: 100BASE-TX is supported by the QJ71FL71-T-F01 only.

(1) LED indications

1) LED indicators

The QJ71FL71-T-F01

RUN ☐	☐ PER
☐	☐
LNK ☐	☐ 100M
TX ☐	☐ RX

Other than the QJ71FL71-T-F01

RUN ☐	☐ PER
☐	☐
LNK ☐	☐
TX ☐	☐ RX
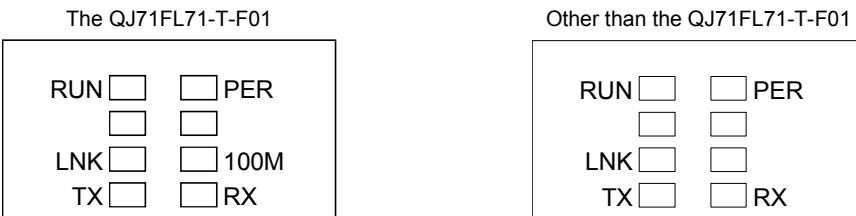
LED Name	Indication	LED on	LED off
RUN (Green)	Normal operation	Normal	Error ($*^1$)
LNK (Green)	Token passing indicator	Token passing status	No token passing
TX (Green)	Data send status indicator	Sending data	Not sending data
PER (Red)	Network parameter setting	Setting error ($*^2$)	Setting normal
100M (Green)	Transmission speed	100Mbps	10Mbps/Unconnected
RX (Green)	Data receiving status indicator	Receiving data	Not receiving data

$*1$: [RUN]LED turns off under the following conditions.
- Hardware error
- Watchdog timer error

$*2$: [PER]LED turns on when:
- Setting value is out of the range. (e.g. mode, node number, or assignment)
- A critical error is detected.

4 MOUNTING THE FL-net MODULE

This chapter explains the precautions during the mounting and installation of the FL-net module and introduces information about the installation environment.

4.1 Mounting and Installation

Refer to the user's manual for the programmable controller CPU module being used for details about the mounting and installation of the FL-net module.

4.2 Precautions when Handling

This section explains the precautions for the FL-net module itself.

(1)   The case for the FL-net module is plastic. Do not drop it or expose it to strong impact.

(2)   Tighten the screws such as module fixing screws within the following ranges.

Screw location	Tightening torque range
External power supply terminal screw (M2.5 screw) (*1)	0.40 N•m
Module fixing screw (Normally not required) (M3 screw) (*2)	0.36 to 0.48 N•m

　*1 : External supply power input terminal to be used to supply power to the transceiver for connection to 10BASE5.

　*2 : The module can be easily fixed onto the base unit using the hook at the top of the module.
　　　 However, it is recommended to secure the module with the module fixing screw if the module is subject to significant vibration.

⚠ WARNING
- Never touch the terminals or connectors while the power is on. Electrical shock or malfunctioning could result.
- Before cleaning the module or retightening the terminal screws and module fixing screws, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to completely shut off all phases of the external power supply may cause module breakdowns and malfunctions. If the screws are loose, it may cause the module to short-circuit, malfunction or fall off. If the screws are tightened excessively, it may damage the screws and cause the module to short circuit, malfunction or fall off.
- Always use the utmost care when performing control operations (especially when changing the data, program or operating status conditions) when the programmable controller is in operation.

⚠ CAUTION	• While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely mount the module with the fixing hole as a supporting point. If the module is not installed properly, it may cause the module to malfunction, fail or fall off. Secure the module with screws especially when it is used in an environment where constant vibrations may occur. • Never allow foreign material, such as metal particles or small pieces of wire, to enter the module. It could cause malfunctioning, damage or fire. • Never disassemble or modify the module. This may cause breakdowns, malfunctions, injuries or fire. • Before mounting or dismounting the module, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to do so may damage the product. • Always tighten the screws to within the specified torque range. If the screws are loose, shorting or malfunctioning could result. If the screws are too tight, they could break off, fall into the module and cause shorting or malfunctioning. • Never directly touch the electrical parts or any conductive component of the module. It could cause shorting or malfunctioning of the module. • Dispose of this product as industrial waste.

4

4.3 Installation Environment

Avoid the following environments for the programmable controller.
  • An environment in which the ambient temperature exceeds a range of 0 to 55 °C.
  • An environment in which the relative humidity exceeds a range of 5 to 95 % RH.
  • An environment in which rapid temperature fluctuations could cause condensation.
  • An environment in which there is corrosive or flammable gas.
  • An environment in which there is a high concentration of dust, metal particles or other such conductive particles, oil mist, salt, or organic solvents.
  • An environment that is exposed to direct sunlight.
  • An environment in which strong electric or magnet fields are generated.
  • An environment that is exposed to direct vibration or impact.

⚠ CAUTION	• Use the programmable controller in the operating environment that meets the general specifications of this manual. Using the programmable controller in any other operating environments may cause electric shocks, fires or malfunctions, or may damage or degrade the product.

5 WIRING THE FL-net MODULE

This chapter explains the methods for connecting the FL-net module to a 10BASE5, 10BASE-T/100BASE-TX or 10BASE2 network.

5.1 Communication Cable Connections

The following are the precautions to be followed when connecting the FL-net module to a network. Always read and understand the procedures and precautions before starting the operations. Keep safety a priority at all times.

(1) The installation of 10BASE5, 10BASE-T/100BASE-TX or 10BASE2 networks requires strict adherence to safety precautions. Consult a specialist when connecting cable terminals or installing trunk line cables, etc.

(2) The cables used must meet the specifications shown in Section 3.1.2.

(3) Coaxial cable has a limited permissible bending radius. Accordingly, if the coaxial cable is to be bent during routing, a space greater than its permissible bending radius is required. The permissible bending radius of the coaxial cable being used is provided by the manufacturer of the cable.

⚠ CAUTION	• When routing AUI cable (transceiver cable)/coaxial cable, never bundle them with or position them near other cables, especially main circuit cables and power cables. Always provide at 100 mm or more between them. Positioning the cables too close to each other could cause the module to malfunction from the electrical noise. • Make sure that the power supply for the sequencer for the station where the unit is mounted and the power supply for the FL-net (OPCN-2) system are off before making AUI cable connections. • Make sure to place the communication and power cables to be connected to the module in a duct or fasten them using a clamp. If the cables are not placed in a duct or fastened with a clamp, their positions may become unstable and may move, or they may be pulled inadvertently. This may damage the module and the cables or cause the module to malfunction because of faulty cable connections. • When disconnecting the communication and power cables from the module, do not pull the cables by hand. When disconnecting a cable with a connector, hold the connector to the module by hand and pull it out to remove the cable. When disconnecting a cable connected to a terminal block, loosen the screws on the terminal block first before removing the cable. If a cable is pulled while being connected to the module, it may cause the module to malfunction or damage the module and cables.

5.1.1 Connecting to QJ71FL71-B5(-F01)

This section explains the methods of connecting the QJ71FL71-B5(-F01) to the network.

(1)   Connecting to 10BASE5 network

This section introduces the methods for connecting the FL-net module to a 10BASE5 network. (Target module of explanation : QJ71FL71-B5(-F01))
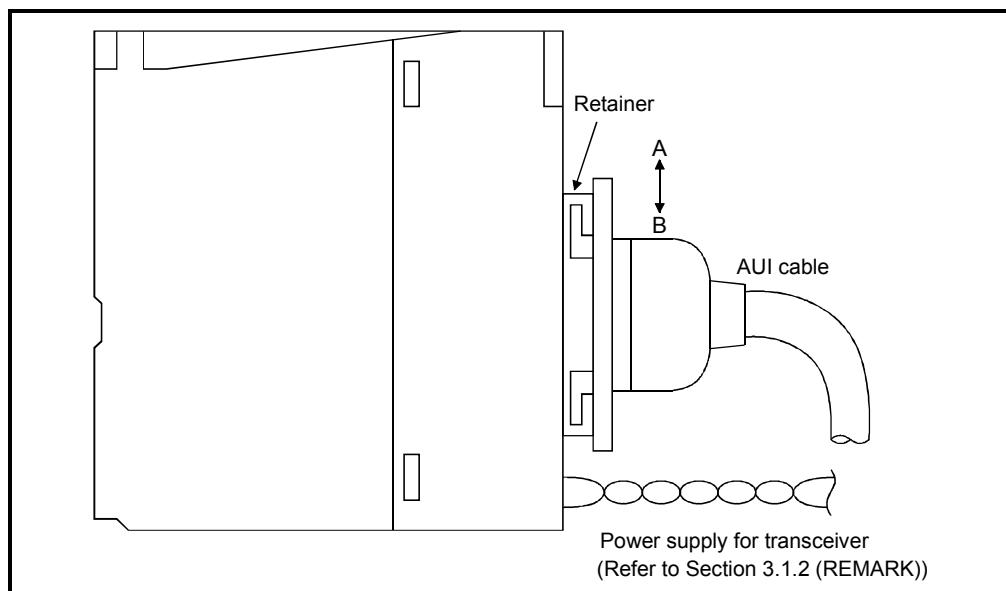
Fig. 5.1 Diagram of AUI cable connection

<Operating procedure>
(Step 1)   Slide the retainer in the direction of B shown in Fig. 5.1
(Step 2)   Insert the AUI connector all the way.
(Step 3)   Slide the retainer in the direction of A shown in Fig. 5.1
(Step 4)   Check that the AUI cable is locked.
(Step 5)   Turn on the power supply for transceiver (*1).
*1 : Use a transceiver that is equipped with a function generally called as SQE TEST or heartbeat (a signal that is used for checking normal transceiver operation after transmission).

⚠ CAUTION
• Make sure that the power supply for the sequencer for the station where the unit is mounted and the power supply for the FL-net (OPCN-2) system are off before making AUI cable connections.

POINT

(1) When connecting to the network using 10BASE5 and countermeasures against noise and high-frequency waves are required for the installation environment of the FL-net module, attaching a ferrite core to the transceiver side of the AUI cable is often effective.
Refer to the Point provided in Section 3.1.2.

(2) Refer to Section 3.1.2 (1) for the example of device and system configuration which is required to connect to the 10BASE5.

5.1.2 Connecting to QJ71FL71-T(-F01)

This section explains the methods of connecting the QJ71FL71-T(-F01) module to the network.

(1) Connecting to 10BASE-T/100BASE-TX network (The QJ71FL71-T supports 10BASE-T only.)
This section explains the methods for connecting the FL-net module to a 10BASE-T/100BASE-TX network. (Target module of explanation : QJ71FL71-T(-F01))
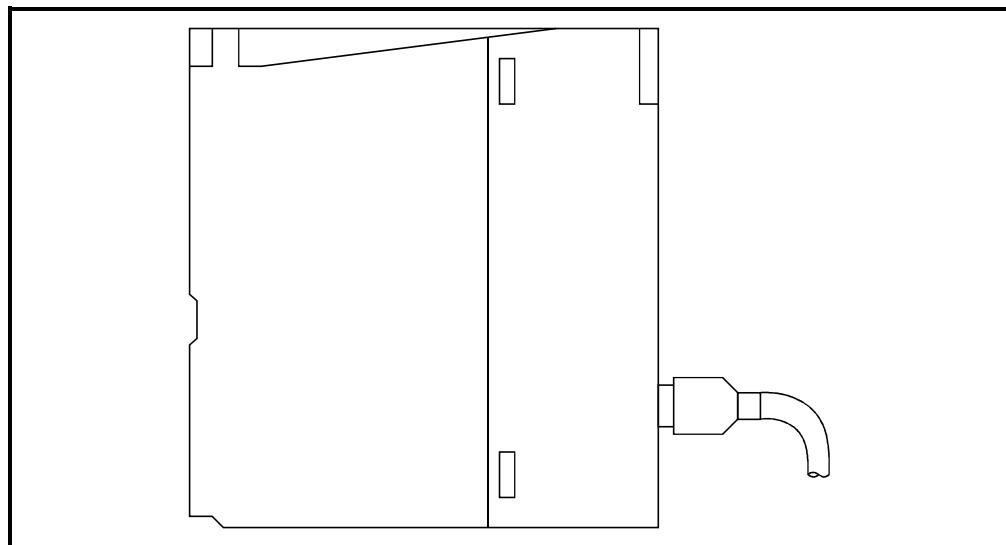
Fig. 5.2 Diagram of 10BASE-T/100BASE-TX cable connection

<Operating procedure>
(Step 1)   Connect the twisted pair cable to the hub.
(Step 2)   Connect the twisted pair cable to the FL-net module.

POINT
(1) The QJ71FL71-T-F01 detects whether it is 10BASE-T or 100BASE-TX, and the full-duplex or half-duplex transmission mode according to the hub.
For connection to a hub that does not have the auto negotiation function, set the half-duplex mode on the hub side.
(2) Refer to Section 3.1.2 (2) for equipment required for 10BASE-T/100BASE-TX connection and a system configuration example.

5.1.3 Connecting to QJ71FL71-B2(-F01)

This section introduces the methods of connecting the QJ71FL71-B2(-F01).

(1)   Connecting to 10BASE2 network

This section explains the methods for connecting the FL-net module to a
10BASE2. (Target module of explanation : QJ71FL71-B2(-F01))
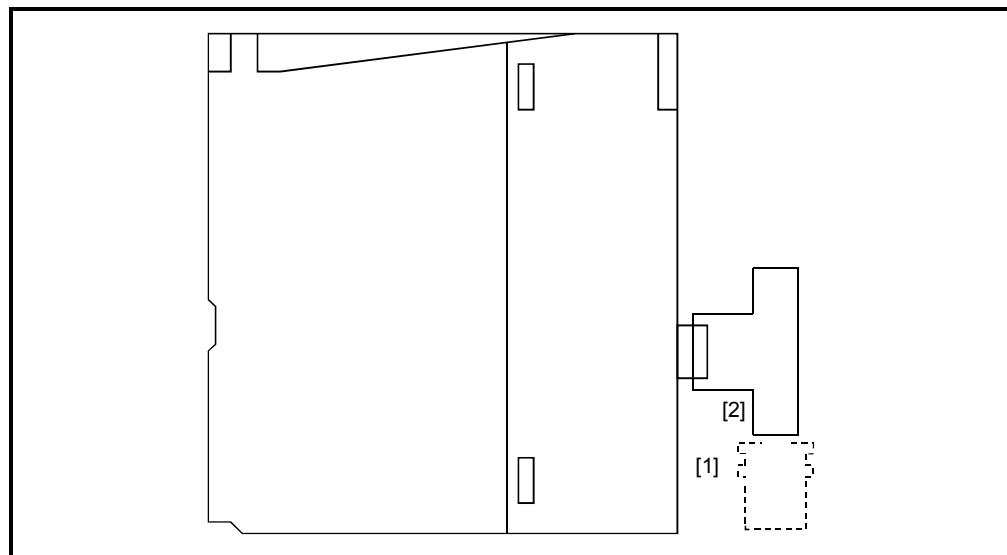
Fig. 5.3 Diagram of 10BASE2 cable connection

<Operating procedure>
(Step 1)   As shown in Fig. 5.3, align the grooves (1) and tab (2) and push
in.
(Step 2)   While pushing the connector in, turn the connector to the right
until it locks.
(Step 3)   Confirm that the connector has been locked.

POINT

Refer to Section 3.1.2 (3) for the example of device and system configuration which
is required to connect to the 10BASE2.

REMARK

Connecting the connector for the coaxial cable
The following explains the methods for connecting the cable and BNC connector
(the connector plug used for coaxial cable).

(1) Configuration of BNC connector and coaxial cable
The configuration of the BNC connector and coaxial cable is shown in Fig. 5.4.

Design of BNC connector	Configuration of coaxial cable
Nut Washer Gasket Plug shell Clamp Contact	External sheath External conductor Insulator Internal conductor
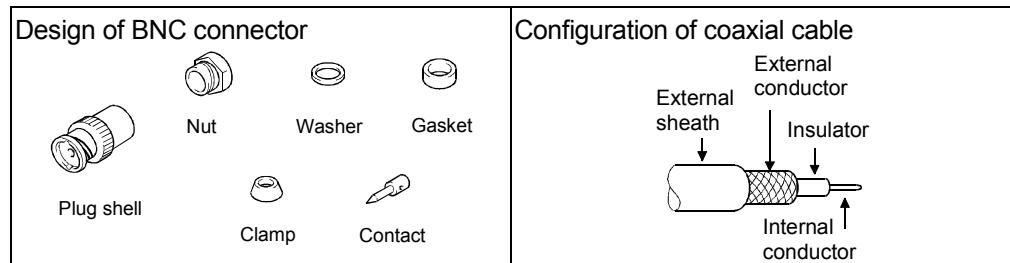
Fig. 5.4 Configuration of BNC connector and coaxial cable

(2) Connecting BNC connector and coaxial cable
The method for connecting BNC connector and coaxial cable is shown below.

(a) Remove the external sheath for the coaxial · · · · · ·
as shown in the illustration on the right.
Use care not to damage the external
conductor.

10mm
Dimensions of section of
external sheath to be removed

↓
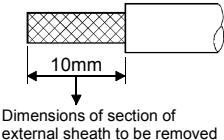
(b) Place the nut, washer, gasket and clamp · · · · · ·
on the coaxial cable as shown in the
illustration on the right and expose the
outer conductor.

Clamp
Nut
Washer
Gasket

↓
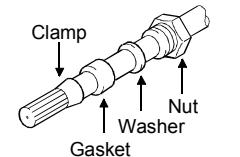
(c) Cut the external conductor, insulator and · · · · · ·
internal conductor to the dimensions
shown in the illustration on the right.
Note that the external conductor is cut to
the same dimension as the tapered section
of the clamp and connect the clamp.

Internal   Insulator
conductor

5mm
7mm
Clamp and
External conductor

↓
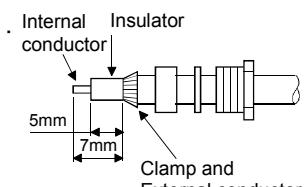
(d) Solder the contact to the internal conductor. · · · · · ·

Solder

↓
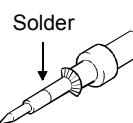
(e) Push the contact assembly created in (d) · · · · · ·
into the plug shell and tighten the nut.
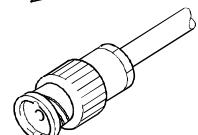
POINT

Pay attention to the following precautions when soldering the internal conductor
and contact.
(1) Use care to prevent the solder from building up on the soldered section.
(2) Use care to prevent a gap from forming between the cable insulator and the
contact. Also use care to prevent them from digging into each other.
(3) Perform the soldering quickly to prevent deformation of the insulator.

6 USAGE GUIDE

This chapter explains an general summary of FL-net (OPCN-2), the settings required for communication and an introduction of how to use it.

6.1 About Ethernet

FL-net (OPCN-2) uses Ethernet as the communication medium (physical level, data link) among FA controllers.

6.1.1 10BASE5 system

As shown below, the basic structure is comprised of a coaxial cable up to 500 meters long to which the nodes are attached. The nodes are connected to the coaxial cable by a transceiver cable (AUI cable) and transceiver. There are two types of transceivers: the single port transceiver to which only one transceiver cable (AUI cable) can be attached and the multi-port transceiver to which multiple cables can be attached.
This basic design is called a segment. Each segment can have up to 100 nodes.

6
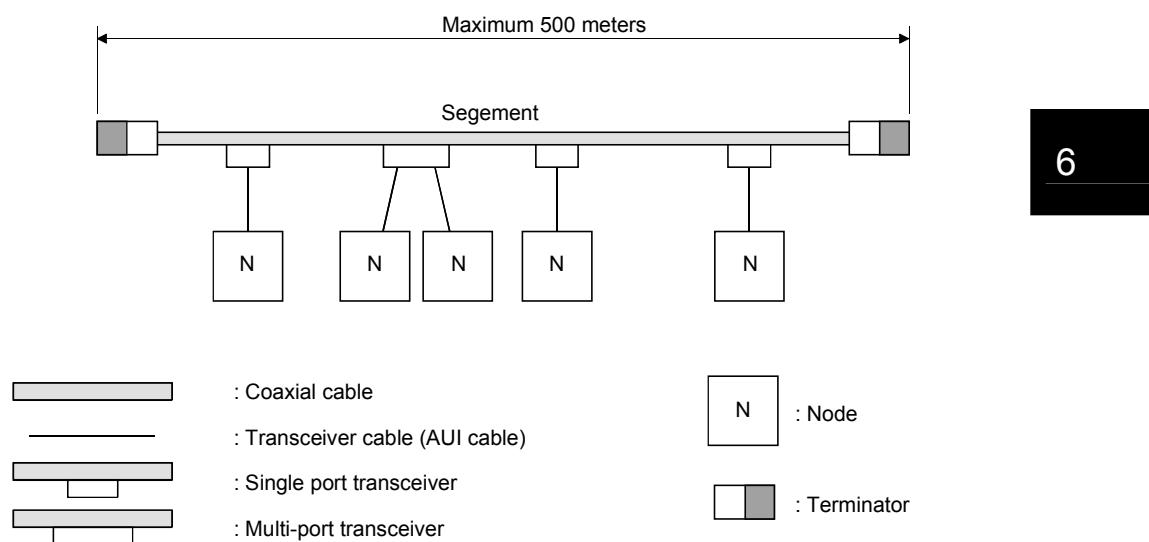
When the distance between nodes exceeds 500 meters, a repeater can be used to
increase the number of segments as shown in the illustration below. The system
shown in the illustration below has a maximum distance of less than 1500 meters and
is arranged so that there will be two repeaters or less between any two nodes.

(R) : Repeater

N : Node

: Terminator
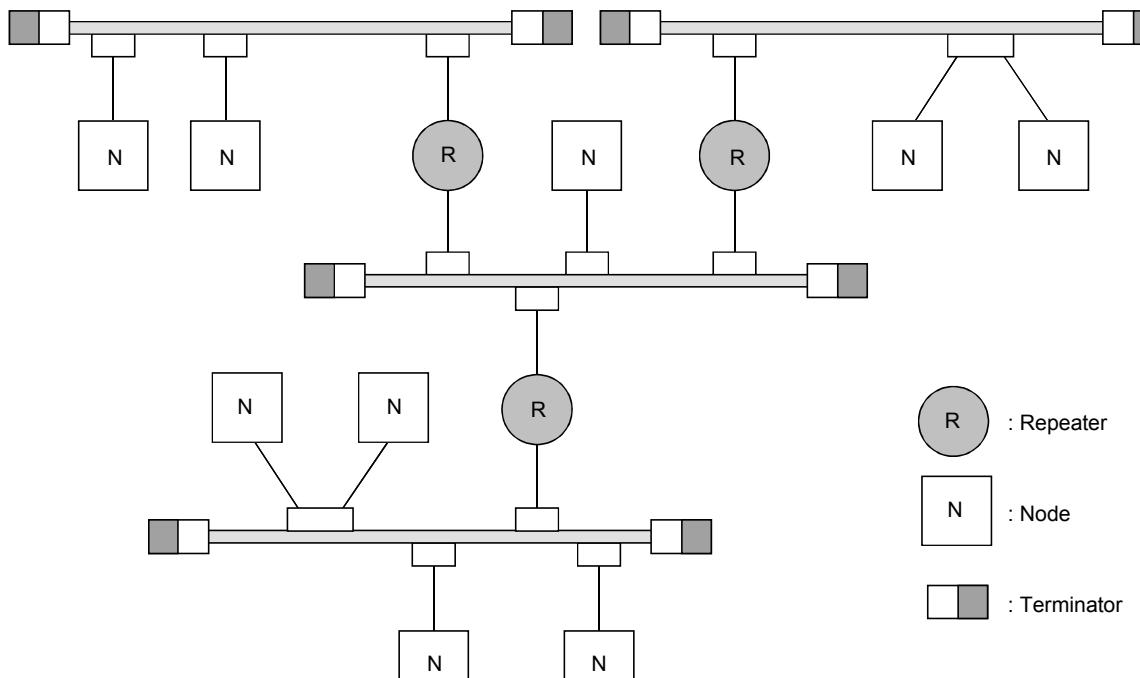
POINT

(1) The repeater is connected to the coaxial cable via a transceiver and
     transceiver cable.

(2) A repeater can be mounted to a transceiver at any position along a coaxial
     cable segment.

(3) Mounting interval for a transceiver should be an integral multiple of 2.5 meters.

6

In the example in the illustration below, the maximum distance between nodes is 2,500 meters. In order to increase the transmission distance, a link cable (the maximum is 500 meters for coaxial cable) with repeaters installed at both ends is used. This is called a linked segment.

Note that there are no nodes connected to the link segment. Instead of a node, the link segment with repeaters at both ends, shown in the dotted line boxes in the illustration below, can be counted as one repeater and thereby reduce the limit for the total number of repeaters between any given node segment.

: This section can now be seen as one repeater.

R : Repeater

N : Node

: Terminator
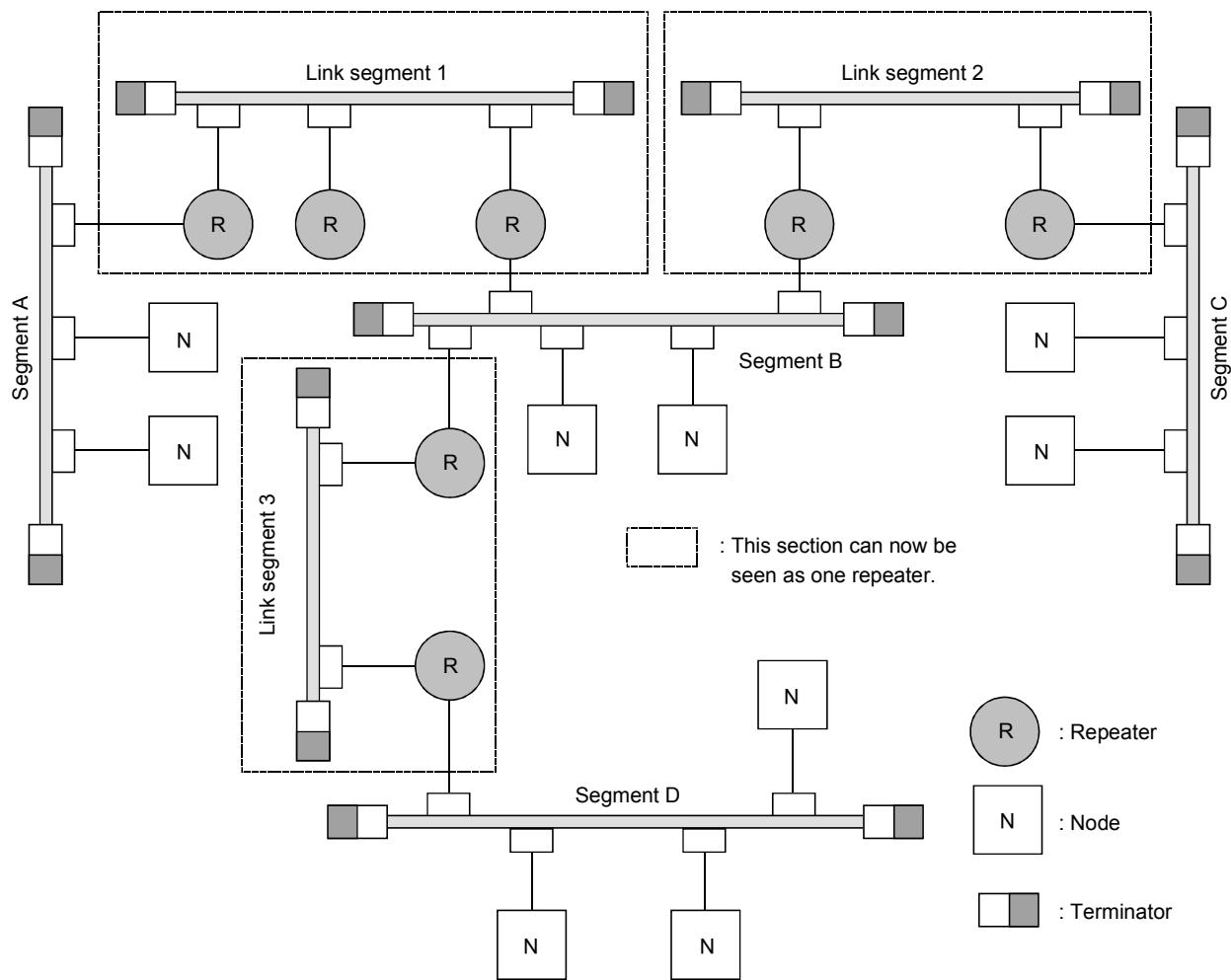
POINT

(1) The maximum length of a link segment is 500 meters.

(2) Do not connect nodes within a link segment.

(3) The link segment with repeaters at both ends, within area indicated by the dotted line boxes ⬜ in the illustration, can be viewed as one repeater.

(4) Use two or less repeaters within any given node segment.

(5) Set only one segment for connecting two or more repeaters.

The following shows the general specifications for configuring an Ethernet system.

Item	Specification
Maximum segment length	500 m
Maximum number of transceivers that can be mounted within on segment	100 units
Maximum distance between nodes	2500 m or less
Maximum number of nodes per system	254 nodes
Maximum length of transceiver cable (AUI cable)	50 m
Cable length between transceiver and repeater	2 m or less (recommended)
Maximum number of repeaters that can be used within a node segment system	2 repeaters (Note that a link segment with a repeater at each end is seen as one repeater)

6.1.2 10BASE-T/100BASE-TX system

If a HUB is used to connect the transceiver cable to the transceiver, multiple nodes can be connected to the hub. Use a twisted pair cable (10BASE-T/100BASE-TX) to connect the nodes to the HUB.
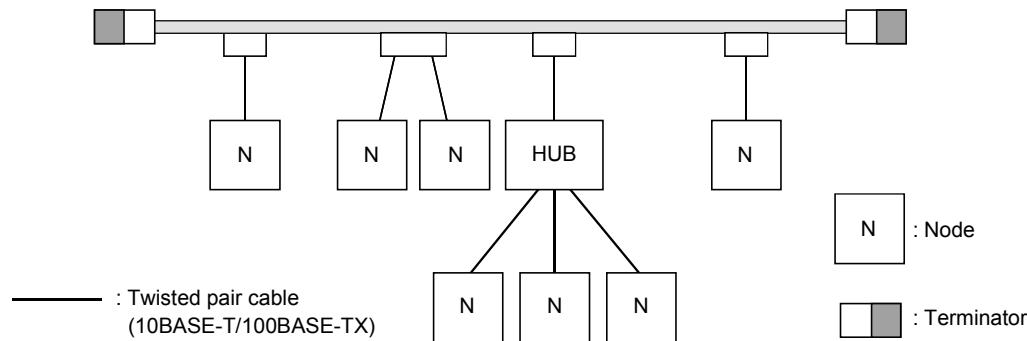
In addition, if the distance between nodes is short, the twisted pair cable can be connected to the HUB without passing through a coaxial cable or transceiver.

6.1.3 10BASE2 system

A T-shaped branch connector is mounted to the BNC connector on each node and coaxial cables are connected at both ends.
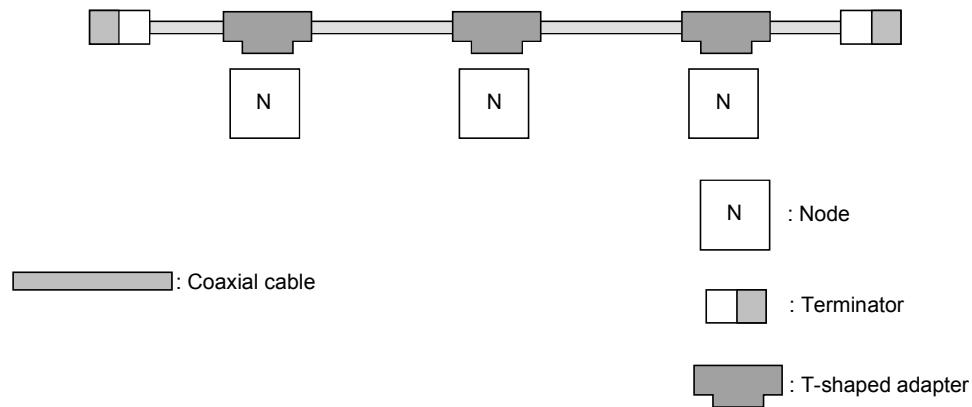
6.1.4 Ethernet IP address

Generally speaking, a 32 bit logical address called an IP address is used in UDP/IP. The IP address consists of a network address and host address. In the FA field, Class C is the most commonly used.

Class C	1	1	0	X	Network address (20 bits)	Host address (8 bits)

Note that this address is separated by a period (.) every 8 bits to make it a decimal expression. The following is an example of an address as expressed in Class C.

11000000	00000010	00000000	00000011
192.	001.	000.	003

Network address   Host address

```
  POINT
(1)  A Class C IP address is used for FL-net (OPCN-2).  Set the IP address within
     the following range.
        Setting range: 192 to 223. ∗∗∗. ∗∗∗. ∗∗∗

(2)  The following is the address default value for FL-net module.
        Default value: 192.168.250.1

(3)  The IP address of the FL-net module is set in the intelligent function module
     switch setting of GX Developer.  (Refer to Section 6.3.2.)
```

6.2 FL-net (OPCN-2)

The section explains a summary of the FL-net (OPCN-2) and the features of its transmission method.

6.2.1 Summary of FL-net (OPCN-2)

(1) Concept of FL-net (OPCN-2)

FL-net (OPCN-2) is an Ethernet-based FA control network.
FL-net (OPCN-2) has both a cyclic transmission function and a message transmission function.
The basic concepts of FL-net (OPCN-2) are as follows.

(a) It uses Ethernet as the communication medium (physical level, data link) among FA controllers.

(b) It uses the UDP/IP propagated on the Ethernet as the basic method for sending data.

(c) It manages/controls (collision avoidance) communication medium access for each node on the network to guarantee transmission within a fixed time.

The object of FL-net (OPCN-2) is to be a FA control network for exchanging data among the programmable controllers, robot controllers (RC), numerical control devices (CNC) and other control devices and personal computers found in manufacturing system.
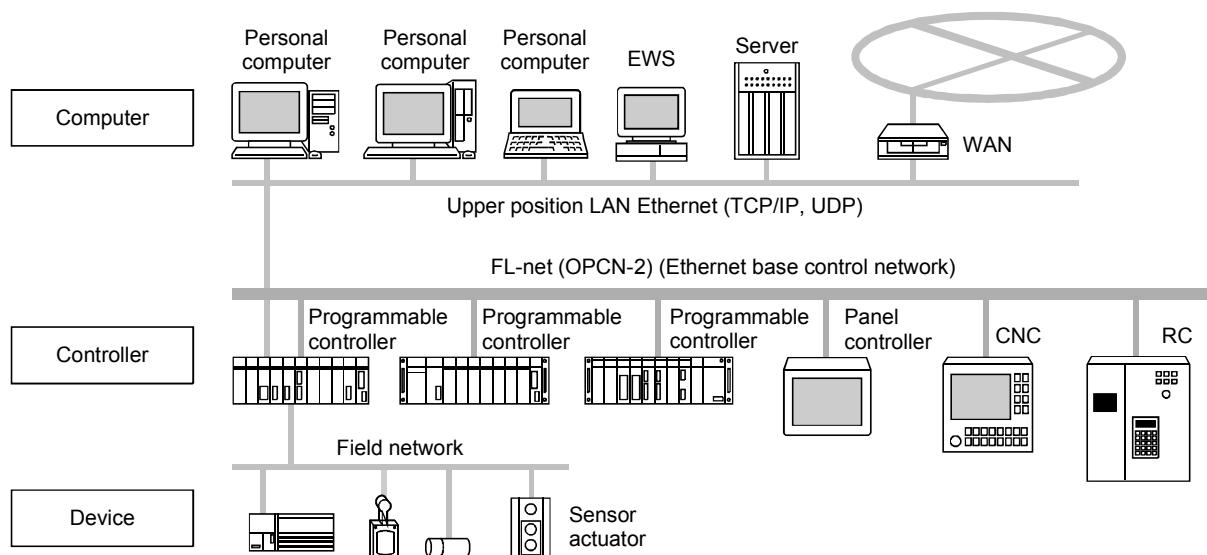
(2) FL-net (OPCN-2) protocol

FL-net (OPCN-2) is comprised of six layers.

Application Layer		Controller · Interface	
FA Link protocol layer		Cyclic Transmission	Cyclic Transmission
			Message Transmission
		Token Function	
Transport Layer		UDP	
Network Layer		IP	
Data Link Layer		Ethernet (IEEE 802.3)	
Physical Layer			

FL-net (OPCN-2) Protocol
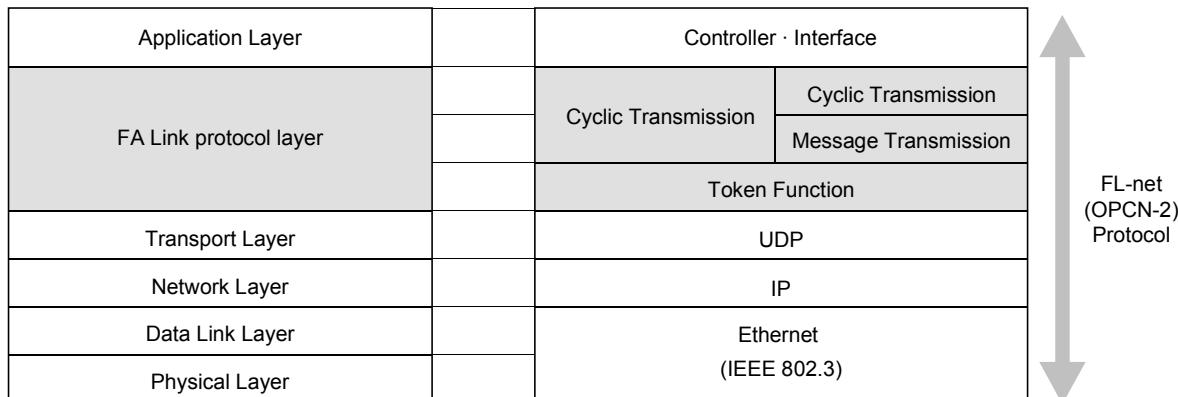
POINT

UDP/IP is used in the transport and network layers and the data link layers and physical layers use Ethernet.

---

(3) Features of the FL-net (OPCN-2) transmission method

The following shows the features of the "FA link protocol layer" for FL-net (OPCN-2).

(a) Transmission control using "masterless token" system avoids collision.

(b) Refresh cycle time can be specified since the system circulates a token in a fixed time.

(c) The token is transmitted together with a cyclic data.

(d) The node with a smallest node number among those who join the network at start-up time shall start to send the token.

(e) If no token is transmitted for a specified time, next node in the token circulation ring shall send a new token.

(f) The masterless token system (characterized by the above two items) will keep the network from stopping in case of failure of some nodes.

(g) The protocol provides information management tables (Other node network parameter area) for useful information to refer operation status of other nodes such as operation mode (RUN/STOP) and hardware malfunction (ALARM).

(4) FL-net (OPCN-2) IP address

The IP address for each node of FL-net (OPCN-2) uses Class C and must be individually set. An IP address is the "address" that designates a specific node (station) when transmission is performed using IP (internet protocol). Because of this, there is a need to set and manage the IP addresses so that there is no duplication. Class C IP address is used for FL-net (OPCN-2).

FL-net (OPCN-2) IP address

Network address	Host address (Node number)
192.168.250	n (n : 1 to 254)

6.2.2 Number of modules connected and node numbers

The IP address for each node of FL-net (OPCN-2) uses Class C and must be individually set. Because of this, there is a need to set and manage the IP addresses so that there is no duplication.
The maximum number of modules that can be connected is 254.

(a)   Node number : (1 to 249)   For conventional FL-net (OPCN-2) usage

(b)   Node number : (250 to 254) For FL-net (OPCN-2) maintenance

(c)   Node number : (255)   Used internally by FL-net (OPCN-2).
                    This cannot be used by the user. (It is used for global address broadcasting.)

(d)   Node number : (0) Used internally by FL-net (OPCN-2).
                    This cannot be used by the user.

FL-net (OPCN-2)

| Network address → | 192.
168.
250. | 192.
168.
250. | | 192.
168.
250. | 192.
168.
250. | 192.
168.
250. | 192.
168.
250. |
| Node number → | 1 | 2 | | 248 | 249 | 250 | 254 |

Node number: 1 to 249 can be used.

Node number: 250 to 254
(for maintenance)
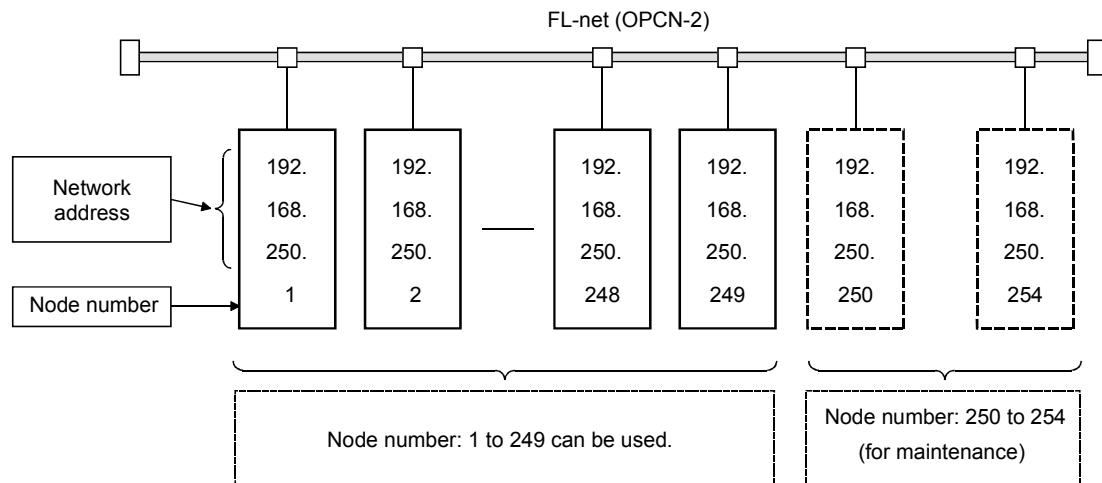
6.2.3 Data communication type

Two types of data communication are supported by FL-net (OPCN-2): cyclic transmission and message transmission. Send timing is controlled by a token. When there is only one token in the network, the station holding the token can send. When there are two or more tokens, the smallest address node number has priority while other are eliminated to continue the network.

Cyclic data with token

Message data

Cyclic transmission

Cyclic transmission and message transmission
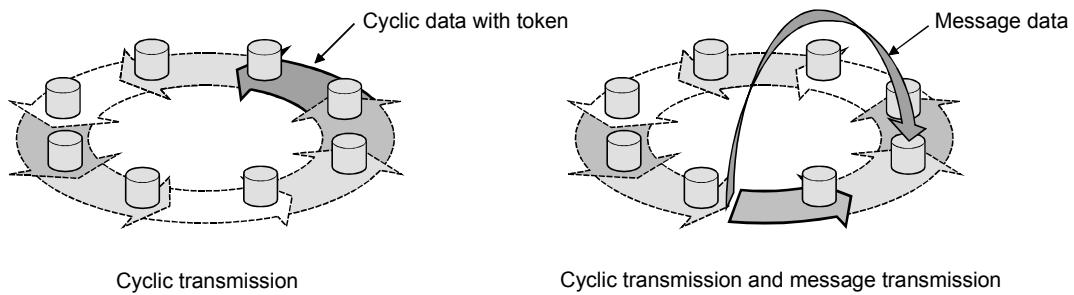
(1) Cyclic transmission

As its name implies, cyclic transmission performs cyclic transmission of the data. Each node is linked to common memory and data is shared.
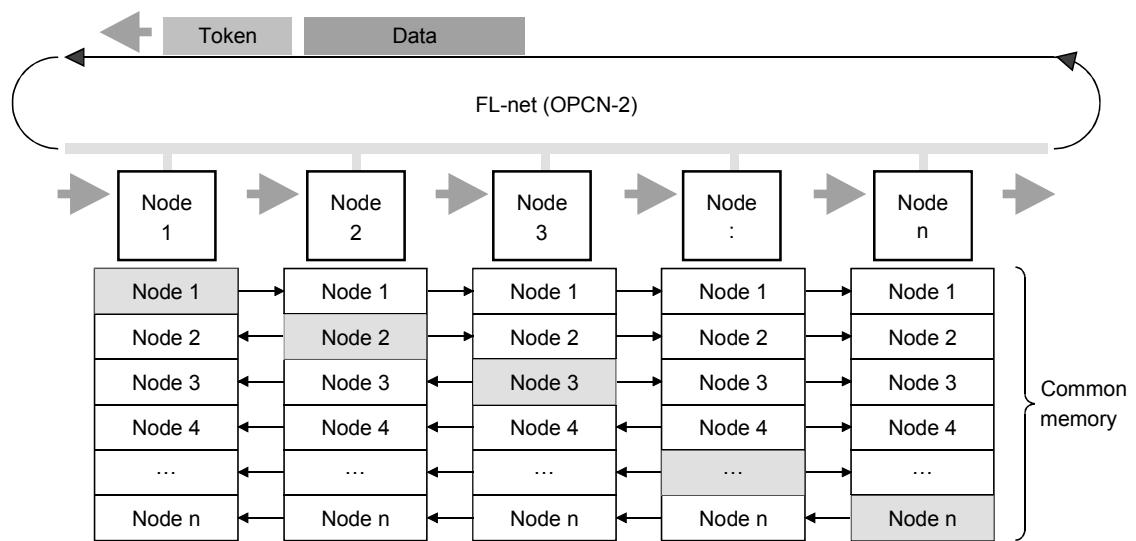
(2)   Message transmission

Conversely, data is not transmitted on cyclically but communication is performed only to a specified node when there has been a request for transmission.
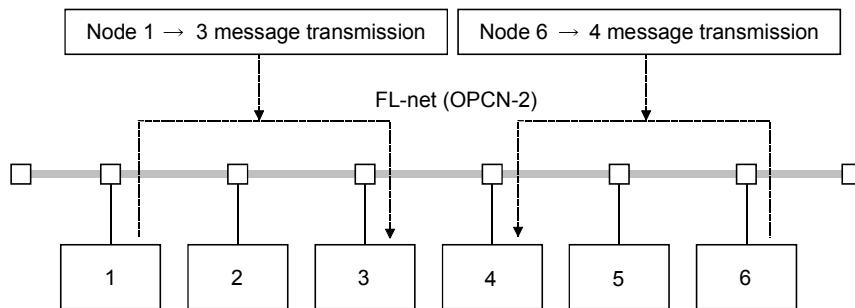
6.2.4 Transmission data volume

This section explains the transmission data volume of cyclic transmissions and message transmissions.

(1)   Cyclic transmissions

The overall network has 8 k bits and + 8 k words common memory areas. The maximum usable send data volume for each node is 8.5 k words. Note that one word is two bytes.
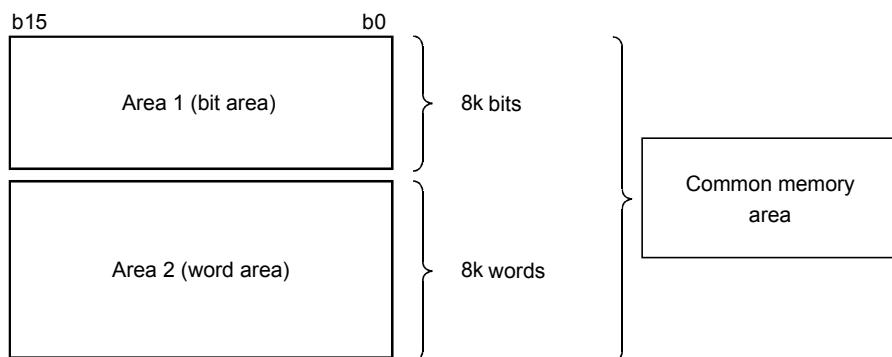
(2)   Message transmission

The maximum data volume for one message frame is 1024 bytes (not including the header section).
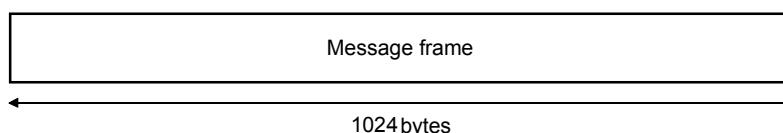
6.2.5 Transfer cycles

In cyclic communication, the common memory is refreshed in nearly fixed cycles. The sending of message communications is controlled so that single message communication will not allow the common memory refresh cycle time to exceed the permissible refresh cycle time. Each node monitors the normal time for message communication frame that flows in the network from the time the token addressed to the local node is received until it is received by the next local node. During this one cycle, when there is not even one message communication frame flowing in the network, the value that is 120 % of the refresh cycle permissible time is the permissible refresh cycle time.

The permissible refresh cycle time is actively determined by the monitoring process presented above and the number of nodes subscribing to the network.

6.2.6 Data area and memory

The FL-net module has a memory area corresponding to the path for each type. Exchange with the CPU module takes place through the buffer memory.
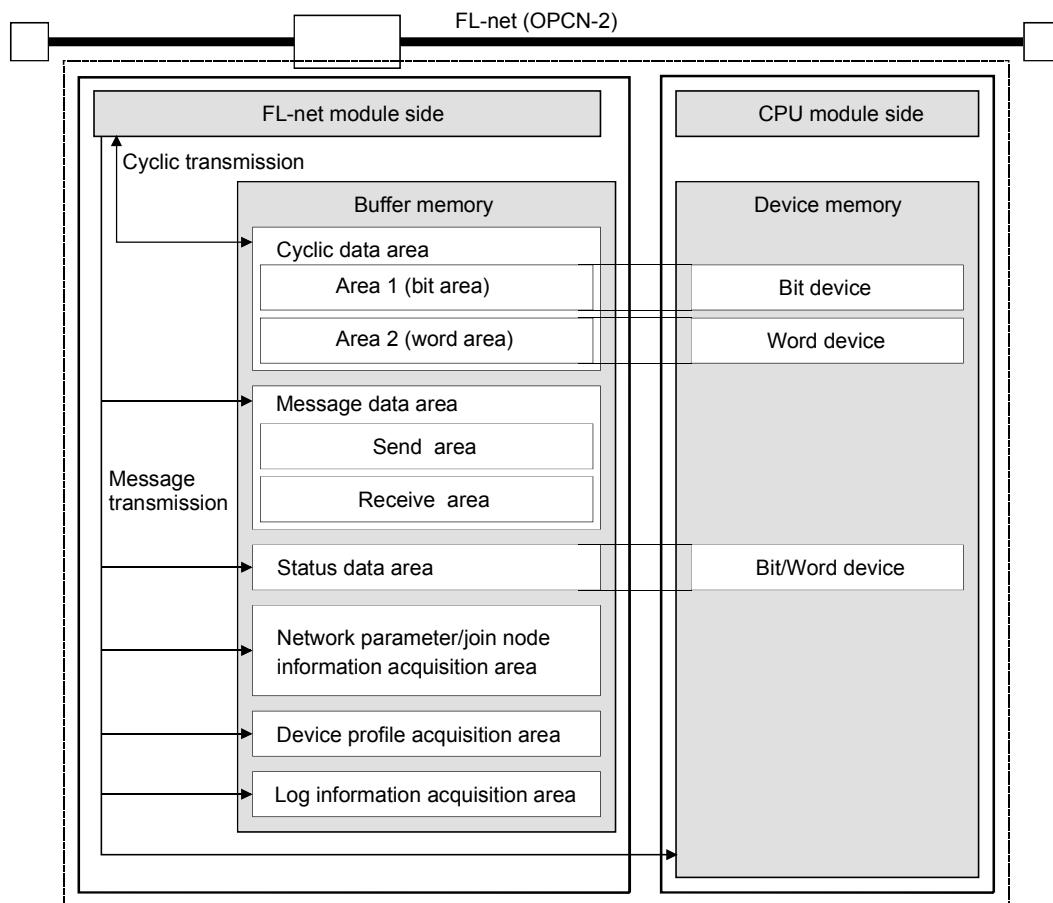
6.2.7 Cyclic transmission and area

(1) Summary of cyclic transmission
Cyclic transmission is the function that supports the cyclic data exchange generated among nodes.

(a) It realizes the common memory function.

(b) The node sends when it is holding the token.

(c) Nodes participating in the network are recognized as entities performing cyclic transmission.

(d) When the token is being held, all cyclic data to be sent is sent.

1) Token
Basically, there is only one token for the network. When there are two or more tokens, the smallest address node number has priority while others are eliminated.

2) Token frame
The frame that includes the token (token frame) has a token address node number and a token dispatch node number. When the node matches the token address node number of the token frame received, it becomes the token holding node.

3) Token sequence
The sequence of the token rotation is determined by the node number. Rotation is performed in ascending order among the nodes that are registered in the participating node control table. The highest node number passes the token to the lowest node number.

(e) Data from a node that has separated from the network retains the data before the separation because there has been no communication.

\<Token rotation and cyclic transmission 1\>

<Token rotation and cyclic transmission 2>
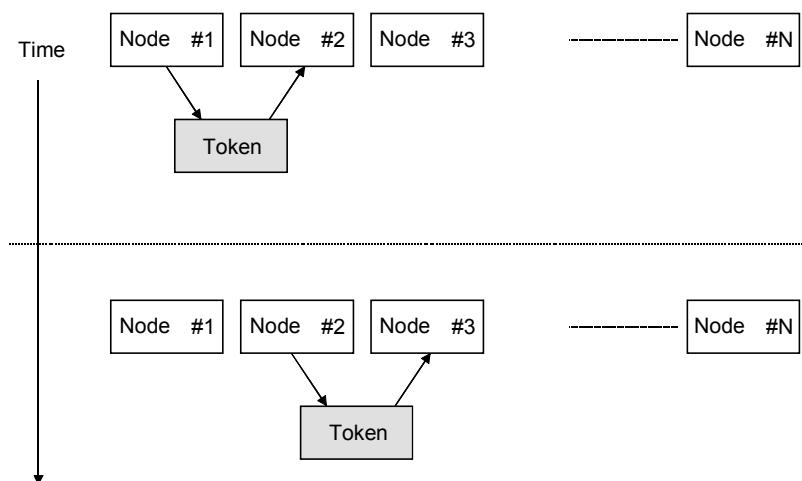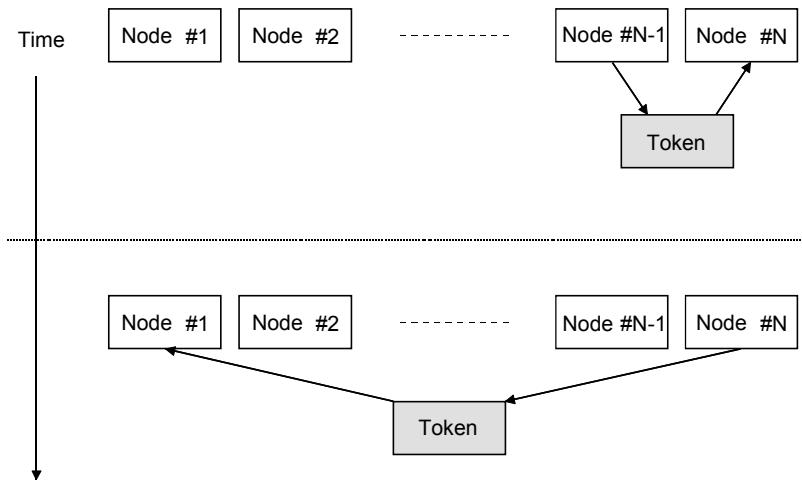
(2) Common memory
The following introduces the concepts for the common memory.

(a) The common memory interface provides nodes with a service that can be regarded as a memory shared among them.

(b) Two area types (Area 1 (bit area) and Area 2 (word area)) may be assigned for a node.

(c) Multiple frames may be used if the transmitting area size of a node exceeds the transmission size of one frame, that is, 1024 bytes.

(d) The common memory will not update itself with receiving data until all frames from a node are successfully received in case of the item (c). Thus time coherency of data from a node will be guaranteed.

(e) Communication unit of each node shall provide fixed area of 8k bits + 8k words = 8.5 k words as the common memory.

(f) Both Area 1 (bit area) and Area 2(word area) can be set at any size within the maximum.

(g) Each node cyclically provides a function for sharing the same data with the entire system by broadcasting the data. Each node in FL-net (OPCN-2) reciprocally divides and receives a send area that is not to be duplicated and data exchange is performed. In the operation of the common memory, the send area assigned in a given node becomes the receiving area for another node.

<Example 1 of common area for cyclic transmission>

Node = 01 of common memory	Node = 02	Node = 03	Node = 04
(Send)	(Receive)	(Receive)	(Receive)
(Receive)	(Send)	(Receive)	(Receive)
⋮	⋮	⋮	⋮
(Receive)	(Receive)	(Receive)	(Send)
⋮	⋮	⋮	⋮
(Receive)	(Receive)	(Send)	(Receive)

<Example 2 of common area for cyclic transmission>

Node = 01 of common memory	Node = 02	Node = 05
(Receive)	(Receive)	(Send)
(Receive)	(Send)	(Receive)
⋮	⋮	⋮
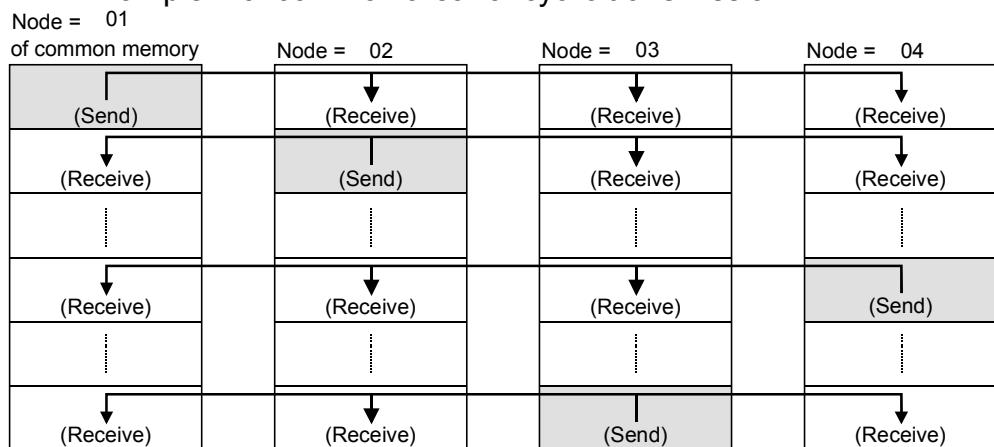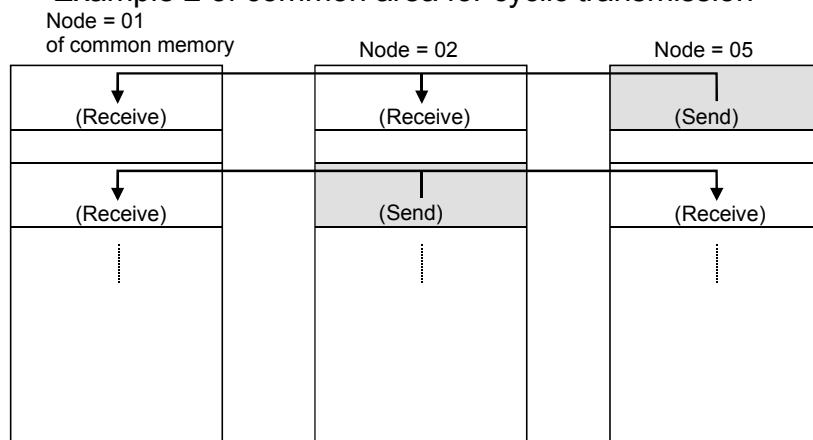
(3) Common memory area 1 (bit area) and 2 (word area)

A node shall be assigned two data areas, area 1 (bit area) and area 2 (word area), as the transmitting areas in its common memory.

Set transmission areas by the first addresses and the sizes of area 1 (bit area) and 2 (word area).

For access between areas 1 (bit area) and 2 (word area), word addresses are used.

Area 1 (bit area) consists of 8 k bits and area 2 (word area) consists of 8 k words.

(Example) Setting example for common memory area 1 (bit area) and area 2 (word area) of the local node (When the local node is node 3)

Node 3

FL-net circuit

FL-net module
Buffer memory
Cyclic data area
(area 1)

Common memory area 1

0000H — 1C00H

Area 1 first address → 0020H — 1C20H   Node 3
Area 1 size → 10H   002FH — 1C2FH
Node 3

01FFH — 1DFFH

Buffer memory
Cyclic data area
(area 2)

Common memory area 2

0000H — 2000H

Area 2 first address → 0200H — 2200H   Node 3
Area 2 size → 100H   02FFH — 22FFH
Node 3

1FFFH — 3FFFH
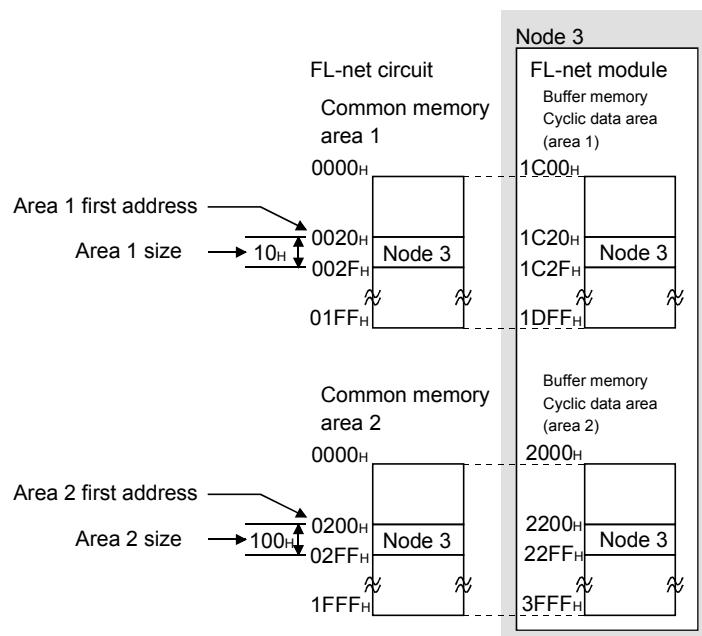
(4) Common memory assignment

(a) Common memory assignment of the local node

Each node assigns only the common memory area (for the node to store send data) of its own node to the local node network parameter area.

POINT

(1) For the information on how to set the local node network parameter area, refer to the following:
 • When using the initial setting of GX Configurator-FL: Section 6.4.8
 • When setting on the sequence program: Section 6.5.1

(2) The common memory of the local node can be assigned without specific attention to the order of nodes. (Note that overlapping with those of other nodes is not allowed.)

(b) Acquisition timing for common memory assignment of other nodes

A node acquires common memory assignment data of the other nodes participating in the network automatically when the node joins the network. Also, it automatically acquires common memory assignment data of a new node when the new node joins the network.

Common memory assignment recognized by Node 3 before joining network

Common memory assignment recognized by Node 3 after joining network

Common memory assignment recognized by Node 3 after participation of Node 6

Empty		
Node 3		
Empty		

Node 3 joins network including Node 1,2,4,5.

Node 1	
Node 2	
Node 3	
Node 4	
Node 5	
Empty	

Node 6 joins network.

Node 1	
Node 2	
Node 3	
Node 4	
Node 5	
Node 6	
Empty	

POINT

Common memory assignment of the other nodes can be confirmed in the other node network parameter area (Address: 0080 to 087F$_H$) in the buffer memory. (Refer to Section 3.2.5 (3) (b).)

(c)   When common memory assignment is overlapped
Common memory assignment must not be overlapped among multiple nodes.
Before participation in the network, check the common memory assignment of all nodes currently joining in the network. If any duplication is identified, the local node will detect an error. (No error will be detected on the other nodes currently participating in the network.)

(5)   Common memory and buffer memory
The common memory represents a virtual memory area and consists of area 1 (bit area) and area 2 (word area).
The FL-net module stores the data of area 1 (bit area) and area 2 (word area) into the cyclic data area (Area 1) (Address: 1C00$_H$ to 1DFF$_H$) and (Area 2) (Address: 2000$_H$ to 3FFF$_H$) accordingly.

Common memory

0000$_H$	
	Area 1
01FF$_H$	
0000$_H$	
	Area 2
1FFF$_H$	

FL-net module

Buffer memory
Cyclic data area 1

	Area 1	1C00$_H$
		1DFF$_H$
		2000$_H$
	Area 2	
		3FFF$_H$
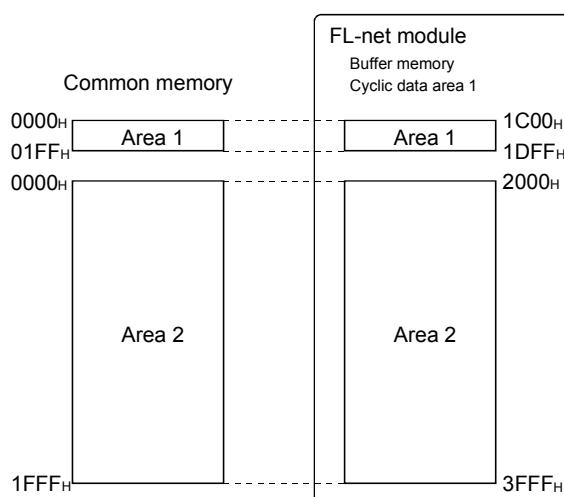
(6)   Transfer methods between the cyclic data area (Area 1, 2) in the buffer memory and programmable controller CPU devices
Data are transferred between the cyclic data area (Area 1, 2) in the buffer memory and programmable controller CPU devices by either of the following methods.

Transfer method	Description	Reference
Using the auto refresh setting	In the auto refresh setting of GX Configurator-FL, specify No. of data transferred and an offset value from the first address of the cyclic data area. No sequence program for transfer is needed.	Section 6.4.9
Using sequence program	On the sequence program, specify No. of data transferred and the cyclic data area using the intelligent function module device (Un\G[]).	Section 6.5.2

> **POINT**
>
> Write the data to be transferred to other station from host station into the "write area" which is the sending range of the local node. Do not write any data into the "read area" which is receiving range from other node. When data is unintentionally written, the system may incur a risk of malfunction after the writing. Read area can be confirmed in other node network parameter area in buffer memory (address: 0080~0087F$_H$). (Refer to Section 3.2.5(3)(b)).

(7)   Guaranteed data consistency
(a)   To guarantee data consistency in cyclic data area (area 2)
Although the FL-net module does not operate in synchronization with a CPU module, data consistency in area 2 (word area) is guaranteed by the following procedures.

1)   When data of double word (32-bit) or smaller is written/read
If the following conditions are met in common memory assignment, data consistency in area 2 (word area) is automatically guaranteed.
1. The first address of area 1 (bit area) is multiples of 2.
2. The size of area 1 (bit area) is multiples of 2.
3. The first address of area 2 (word area) is multiples of 2.
4. The size of area 2 (word area) is multiples of 2.

2)   When data larger than double word (32-bit) is written/read
Data consistency in area 2 (word area) is guaranteed for each node by the following procedures.
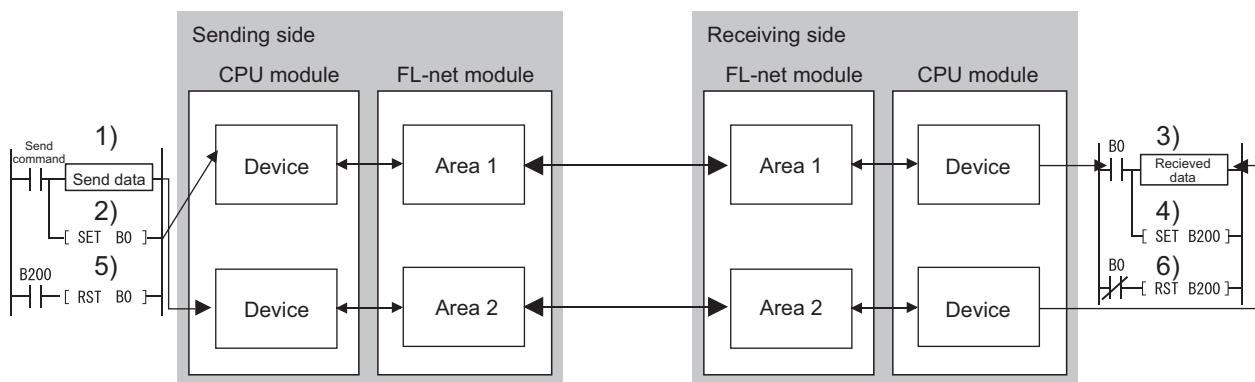
(Sending side)
1. Write send data to area 2 (word area).
2. Turn on the bit of area 1 (bit area).

Upon receiving a token, the FL-net module sends data of area 1 (bit area) and then data of area 2 (word area).

(Receiving side)
3. Because the data are received at area 2 (word area) and then area 1 (bit area) of the FL-net module, read the received data from area 2 when the bit of area 1 is turned on.
4. When reading of received data is completed, turn on the bit of area 1 (bit area).

(Sending side)
5. After checking that the reading of received data is completed at receiving side, turn off the bit of area 1 (bit area).

(Receiving side)
6. After checking that the bit of area 1 (bit area) is turned off at sending side, turn off the bit of area 1 (bit area) at receiving side.

(b) Handshake program example
The example below shows how to guarantee data consistency in area 2 (word area) for each node when data larger than double word (32-bit) is written/read.
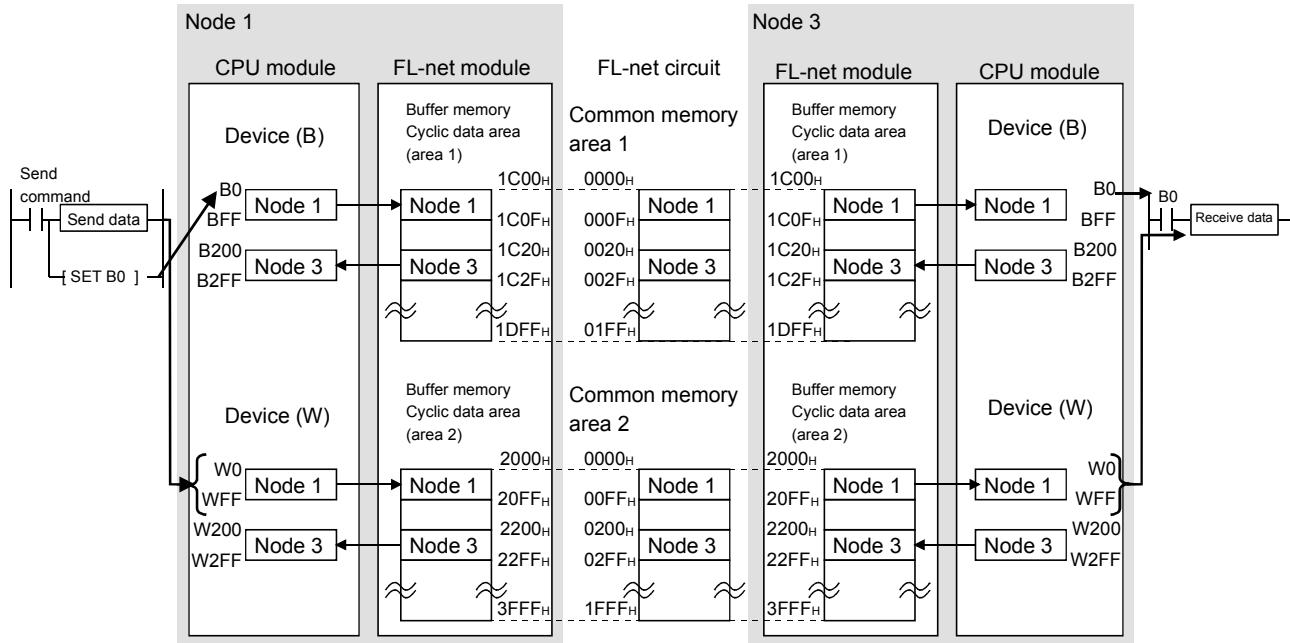
The following is an example program in which W0 to WFF data of node 1 are sent to W0 to WFF of node 3, as shown above.

Upon completion of transmit data storage, B0 is set to ON, resulting in a handshake.

Sending station (Node 1)

```
     1)                                                    2)
     M0    B0    B200                               ┌BMOV  D0    W0    H100 ┐
     ┤├────┤/├───┤/├─────────────────────────────────                      ┘
                       │                             3)┌SET  B0           ┐
                       └──────────────────────────────                    ┘
     B200                                              7)┌RST  B0          ┐
     ┤├────────────────────────────────────────────────                   ┘
     ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
     │     Program for transferring data to cyclic data area (See *1.) │
     └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```

Receiving station (Node 3)

```
     4)                                                    5)
     B0    B200                                      ┌BMOV  W0    D100  H100 ┐
     ┤├────┤/├──────────────────────────────────────                        ┘
                  │                                   6)┌SET  B200          ┐
                  └──────────────────────────────────                       ┘
     B0                                               ┌RST  B200           ┐
     ┤/├────────────────────────────────────────────                       ┘
     ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
     │     Program for transferring data to cyclic data area (See *1.) │
     └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
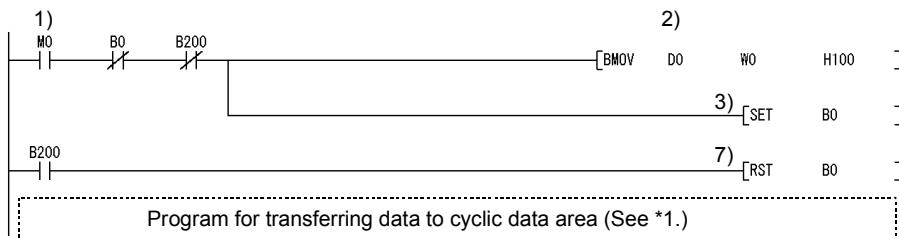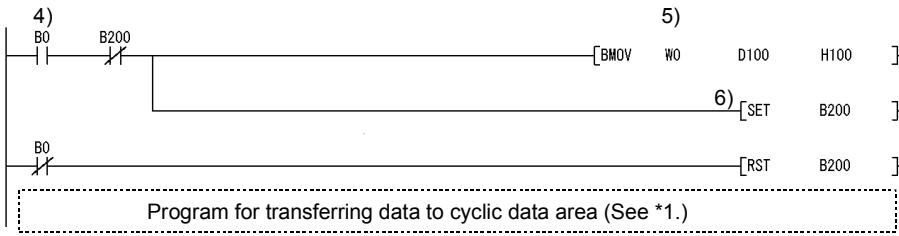
1)   Send command (M0) is set to ON.
2)   Data in D0 to D255 are stored in W0 to WFF.
3)   Upon completion of storing data into W0 to WFF, B0 for handshaking is set to ON.
4)   By cyclic transmission, area 2 (word area) data and then area 1 (bit area) data are sent, and B0 of the receiving station is set to ON.
5)   Data in W0 to WFF are stored in D100 to D355.
6)   Upon completion of storing data into D100 to D355, B200 for handshaking is set to ON.
7)   When the data are delivered to the receiving station, B0 is set to OFF.

*1 If the auto refresh is not set up (Refer to Section 6.4.9.), transfer CPU module data to the cyclic data area of the FL-net module, using the following sequence program.

Sending station (Node 1)

```
 X19  U0\G2528.1                            U0\
 ┤├───┤/├──────────────────────────┌BMOV  W0    G8192  H100 ┐   Writes data to node 1 area 2.
              │                                                  (Address: 2000H to 20FFH (8192 to 8447))
              │                             U0\
              └─────────────────────┌BMOV  K4B0  G7168  H10  ┐   Writes data to node 1 area 1.
                                                                (Address: 1C00H to 1C0FH (7168 to 7183))
 U0\G2528.3                          U0\
 ┤/├──────────────────────────────┌BMOV  G7200 K4B200 H10  ┐   Reads data from node 3 area 1.
              │                                                 (Address: 1C20H to 1C2FH (7200 to 7215))
              │                             U0\
              └─────────────────────┌BMOV  G8704 W200   H100 ┐   Reads data from node 3 area 2.
                                                                (Address: 2200H to 22FFH (8704 to 8959))
```

Receiving station (Node 3)

```
 X19  U0\G2528.3                            U0\
 ┤├───┤/├──────────────────────────┌BMOV  W200  G8704  H100 ┐   Writes data to node 3 area 2.
              │                                                  (Address: 2200H to 22FFH (8704 to 8959))
              │                             U0\
              └─────────────────────┌BMOV  K4B200 G7200 H10  ┐   Writes data to node 3 area1.
                                                                (Address: 1C20H to 1C2FH (7200 to 7215))
 U0\G2528.1                          U0\
 ┤/├──────────────────────────────┌BMOV  G7168 K4B0   H10  ┐   Reads data from node 1 area 1.
              │                                                 (Address: 1C00H to 1C0FH (7168 to 7183))
              │                             U0\
              └─────────────────────┌BMOV  G8192 W0    H100 ┐   Reads data from node 1 area 2.
                                                                (Address: 2000H to 20FFH (8192 to 8447))
```

6.2.8 Message transmission

(1)   Summary of message transmission
Message transmission is the function supporting the asynchronous data exchange generated among nodes.

(a)   When a node receives a token, it sends up to one (message) frame before transmitting cyclic frames.

(b)   Data volume that can be transmitted in a frame is equal to or less than 1024 bytes. (excluding the header).

(c)   Algorithm is provided so as not to exceed permissible refresh cycle time for cyclic transmission.

(d)   Both 1 : 1 transmission to a specific destination node and 1 : n broadcast transmission to all nodes are provided.

(e)   Delivery acknowledgement function is provided to confirm successful delivery of data to the destination node on the 1 : 1 message transmission.

(f)   If message transmission is implemented for a node that has been removed from the network, FL-net module detects an error (error code: C322$_H$ or C323$_H$).

Request

Response

Node 1   Node 2   Node 3   Node 4

1 : 1 Transmission

Request

Receive   Receive   Receive

Node 1   Node 2   Node 3   Node 4

1 : N Transmission
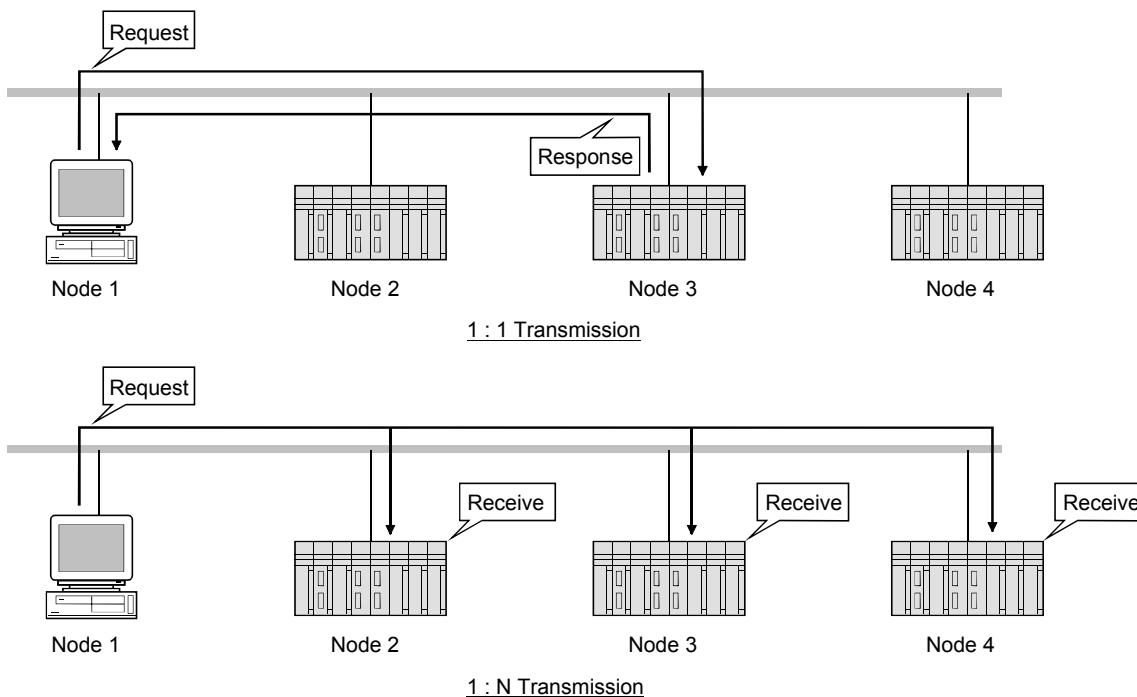
(2) Support message list

No.	Message	1 : 1	1 : n	Server function (*1)	Client function (*2)	Reference
1	Byte block read	○	×	×	○*3	Section 6.5.3(6)
2	Byte block write	○	×	×	○*3	
3	Word block read	○	×	○	○*3	
4	Word block write	○	×	○	○*3	
5	Network parameter read	○	×	○	○	Section 6.5.3(1)
6	Network parameter write	○	×	×	○*3	Section 6.5.3(6)
7	Operate/stop command	○	×	×	○*3	
8	Device profile read	○	×	○	○	Section 6.5.3(2)
9	Log information read	○	×	○	○	Section 6.5.3(3)
10	Log information clear	○	○	○	○	Section 6.5.3(4)
11	Message return	○	×	○	○*3	Section 6.5.3(6)
12	Transparent message transmission	○	○	○	○	Section 6.5.3(5)

○: Enable ×: Disable

*1 : Server function ··· Functions that create a response frame for the request message that has been received and send it.

*2 : Client function ···· Functions that send the response message and receive the response frame.

*3 : Realized by the transparent message transmission. Refer to Section 6.5.3 (5)(6) for the sending method for transparent type message transmission. Also, refer to the external device manual for transaction code.

(3) Transaction code

In each of the messages, its header has a transaction code for requesting or a transaction code for responding that is used for identifying the message frame.

Transaction code		Application
Decimal	Hexadecimal	
0 to 59999 $*^1$	0000H to EA5FH	Transparent type message transmission (User-defined) $*^1$
60000 to 64999	EA60H to FDE7H	Reserved
65000	FDE8H	Cyclic header (with token)
65001	FDE9H	Cyclic header (no token)
65002	FDEAH	Join request frame header
65003	FDEBH	Byte block data read (request)
65004	FDECH	Byte block data write (request)
65005	FDEDH	Word block data read (request)
65006	FDEEH	Word block data write (request)
65007	FDEFH	Network parameter read (request)
65008	FDF0H	Network parameter write (request)
65009	FDF1H	Stop command (request)
65010	FDF2H	Operate command (request)
65011	FDF3H	Read profile (request)
65012	FDF4H	Trigger header
65013	FDF5H	Log read (request)
65014	FDF6H	Log clear (request)
65015	FDF7H	For message return test (request)
65016 to 65202	FDF8H to FEB2H	Reserved
65203	FEB3H	Byte block data read (response)
65204	FEB4H	Byte block data write (response)
65205	FEB5H	Word block data read (response)
65206	FEB6H	Word block data write (response)
65207	FEB7H	Network parameter read (response)
65208	FEB8H	Network parameter write (response)
65209	FEB9H	Stop command (response)
65210	FEBAH	Operate command (response)
65211	FEBBH	Read profile (response)
65212	FEBCH	Reserved
65213	FEBDH	Log read (response)
65214	FEBEH	Log clear (response)
65215	FEBFH	For message return test (response)
65216 to 65399	FEC0H to FF77H	Reserved
65400 to 65535	FF78H to FFFFH	Reserved

＊1: For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2, the codes are as follows:

Transaction code		Application
Decimal	Hexadecimal	
0 to 59599	0000H to E8CFH	Transparent type message transmission (User-defined)
59600 to 59999	E8D0H to EA5FH	Reserved

POINT
A response transaction code is a "request transaction code + 200".

(4) Virtual address space and physical address

When a virtual address space is specified by word block read/write for a Q series FL-net module, an access can be made to the CPU module and MELSECNET/H remote I/O station devices on the target node.

Accessible CPU module and MELSECNET/H remote I/O station devices and their device number ranges are shown below.

(a) Comparison between the virtual addresses and physical address
1) CPU module

Category	Device name		Device type		Address classification		Device number range (Default)		Expression		Remark
			Bit	Word	Physical	Virtual	High Performance model QCPU/Process CPU/Redundant CPU/Universal model QCPU	Basic model QCPU	Decimal	Hexa-decimal	
Internal system	Special relay		○		SM	91	000000 to 002047	000000 to 001023	○		—
	Special register			○	SD	A9	000000 to 002047	000000 to 001023	○		—
Internal user	Input relay		○		X	9C	000000 to 001FFF	000000 to 0007FF		○	If a device number range is changed, up to the maximum device number after the change is accessible. Local devices cannot be accessed.
	Output relay		○		Y	9D	000000 to 001FFF	000000 to 0007FF		○	
	Internal relay		○		M	90	000000 to 008191	000000 to 008191	○		
	Latch relay		○		L	92	000000 to 008191	000000 to 002047	○		
	Annunciator		○		F	93	000000 to 002047	000000 to 001023	○		
	Edge relay		○		V	94	000000 to 002047	000000 to 001023	○		
	Link relay		○		B	A0	000000 to 001FFF	000000 to 0007FF		○	
	Data register			○	D	A8	000000 to 012287	000000 to 011135	○		
	Link register			○	W	B4	000000 to 001FFF	000000 to 0007FF		○	
	Timer	Contact point	○		TS	C1	000000 to 002047	000000 to 000511	○		
		Coil	○		TC	C0					
		Current value		○	TN	C2					
	Accumulated timer	Contact point	○		SS	C7					
		Coil	○		SC	C6					
		Current value		○	SN	C8					
	Counter	Contact point	○		CS	C4	000000 to 001023	000000 to 000511	○		
		Coil	○		CC	C3					
		Current value		○	CN	C5					
	Link special relay		○		SB	A1	000000 to 0007FF	000000 to 0003FF		○	
	Link special register			○	SW	B5	000000 to 0007FF	000000 to 0003FF		○	
	Step relay		○		S	98	000000 to 008191	000000 to 002047 (Not accessible)	○		Basic model QCPU cannot be accessed.
	Direct input		○		DX	A2	000000 to 001FFF	000000 to 0007FF		○	Input relay, output relay are the same. (For direct access)
	Direct output		○		DY	A3	000000 to 001FFF	000000 to 0007FF		○	
	Index register			○	Z	CC	000000 to 000015	000000 to 000009	○		For the Universal model QCPU, Z16 and greater addresses cannot be specified.
—	Normal file register			○	R	AF	000000 to 032767	000000 to 032767	○		—
	Serial number file register			○	ZR	B0	000000 to 0FE7FF	000000 to 007FFFF		○	For the Universal model QCPU, ZR0FE800 and greater addresses cannot be specified.

REMARK

Some device number ranges can be changed from default values in PLC parameter setting for the CPU module. Refer to the manual for the CPU module.

2) MELSECNET/H remote I/O station

Device name	Device type		Address classification		Device number range	Expression		Remark
	Bit	Word	Physical	Virtual	QJ72LP25-25, QJ72LP25G, QJ72LP25GE, QJ72BR15	Decimal	Hexa-decimal	
Special relay	○		SM	91	000000 to 002047	○		—
Special register		○	SD	A9	000000 to 002047	○		
Input relay	○		X	9C	000000 to 001FFF		○	
Output relay	○		Y	9D	000000 to 001FFF		○	
Internal relay	○		M	90	000000 to 008191	○		
Link relay	○		B	A0	000000 to 003FFF		○	Cannot change the allocation
Data register		○	D	A8	000000 to 012287	○		
Link register		○	W	B4	000000 to 003FFF		○	
Link special relay	○		SB	A1	000000 to 0001FF		○	
Link special register		○	SW	B5	000000 to 0001FF		○	

∗: A virtual address is expressed as a 32-bit address as shown below.

Address classification   Device number
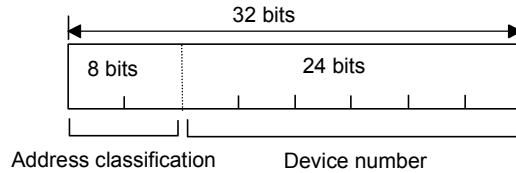
(b)   Virtual address specification (Word block)

1)   Device classification: bit

Item	Contents
Area name	(Example) Input relay (X)
Area size	512 words
Access attributes	Read
Comparison with virtual address (Word block)	<table><tr><td>Natural notation (Device name)</td><td>Virtual address</td></tr><tr><td>X0000</td><td>9C000000H</td></tr><tr><td>X0010</td><td>9C000001H</td></tr><tr><td>X0020</td><td>9C000002H</td></tr><tr><td>:</td><td>:</td></tr><tr><td>X1FF0</td><td>9C0001FFH</td></tr></table>
Data alignment	Corresponds to 1-word word block at device 16 bit (When set from X0000)

2)   Device classification : word

Item	Contents
Area name	(Example) Data register (D)
Area size	12288 words
Access attributes	Read/Write
Comparison with virtual address (Word block)	<table><tr><td>Natural notation (Device name)</td><td>Virtual address</td></tr><tr><td>D0000</td><td>A8000000H</td></tr><tr><td>D0001</td><td>A8000001H</td></tr><tr><td>D0002</td><td>A8000002H</td></tr><tr><td>:</td><td>:</td></tr><tr><td>D12287</td><td>A8002FFFH</td></tr></table>
Data alignment	Device 1 word corresponds to word block 1-word.

(5) Support message details (Server function)

The server function of the support messages is explained in this section.

(a)   Word block read

This function reads messages in word units (1 address 16 bit units) for the virtual address space (32 bit address space) that the corresponding node holds from the network.

The virtual address spaces of the Q series FL-net module are assigned to respective devices (physical addresses) of the CPU module and MELSECNET/H remote I/O station. (Refer to (4).)

Item	Request	Response
Transaction code	65005	65205
Parameter	• Target node number • Virtual address space data size • Virtual address space first address	—
User data	—	Read data (1024 byte space)
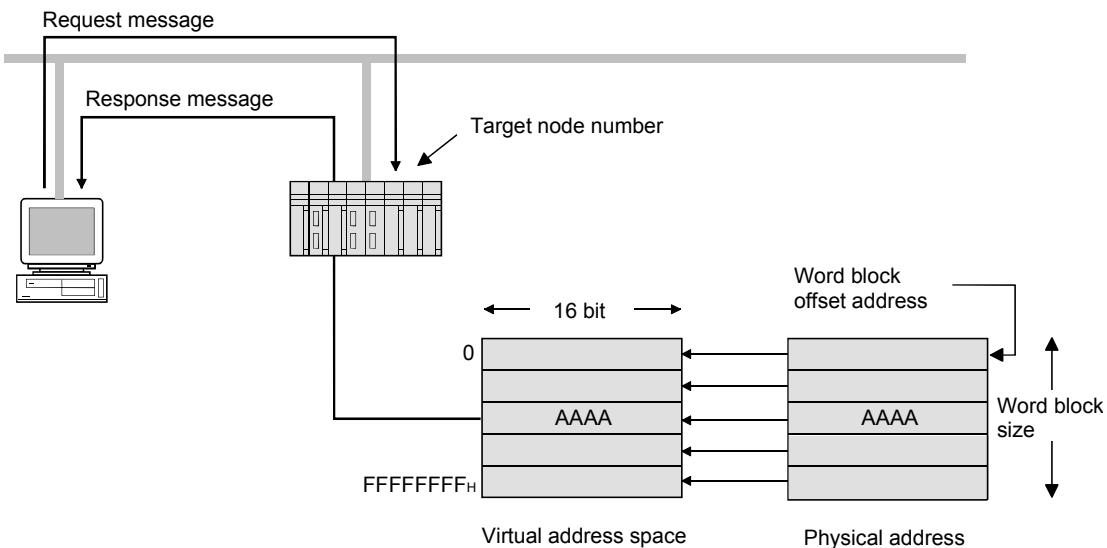
(b) Word block write
This function writes messages in word units (1 address 16 bit units) for the virtual address space (32 bit address space) that the corresponding node holds from the network.
The virtual address spaces of the Q series FL-net module are assigned to respective devices (physical addresses) of the CPU module and MELSECNET/H remote I/O station. (Refer to (4).)

Item	Request	Response
Transaction code	65006	65206
Parameter	• Target node number • Virtual address space data size • Virtual address space first address	—
User data	Write data (1024 byte space)	—
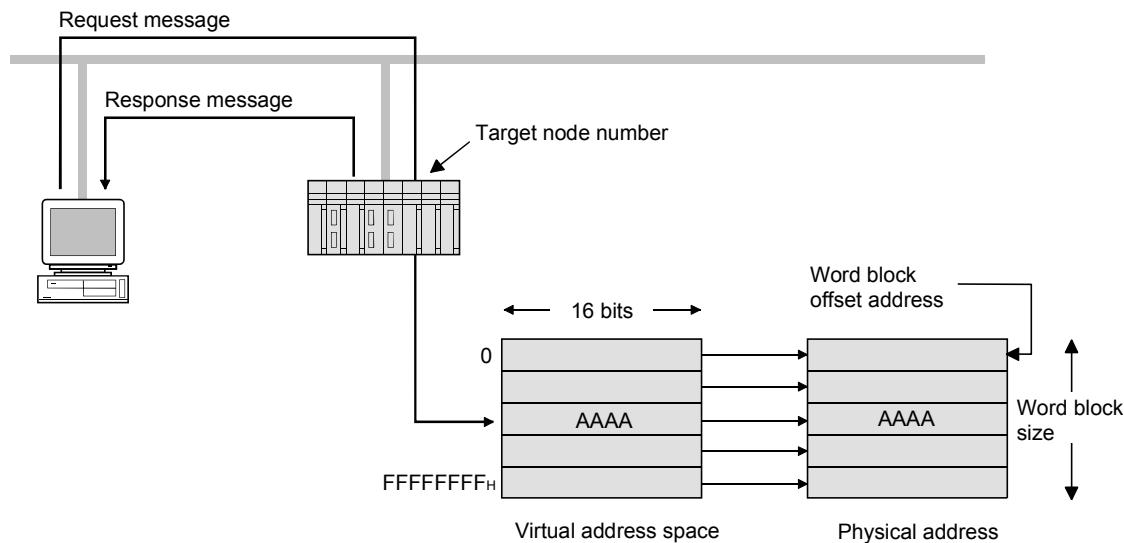
(c)   Read network parameters
       This function reads the corresponding node network parameter data from
       the network.

Item	Request	Response
Transaction code	65007	65207
Parameter	• Target node number	—
User data	—	• Node number • Vender name • Maker model • Node name (equipment name) • Address and size of common memory • Token monitoring time • Permissible refresh cycle time • Refresh cycle measurement time (actual value) • Permissible minimum frame interval • Upper layer status • FL-net (OPCN-2) status • Protocol version

Request message

Response message   Target node number

Node number
Vender name
Maker model
Node name (equipment name)
Area 1 first address
Area 1 size
Area 2 first address
Area 2 size
Token monitoring time
Permissible minimum frame interval
FL-net (OPCN-2) status
Protocol version
Upper layer status
Refresh cycle permissible time / RCT setting value
Refresh cycle measurement value (Current)
Refresh cycle measurement value (Maximum)
Refresh cycle measurement value (Minimum)

Network parameter

(d) Device protocol read
This function reads the device profile data that is the data for the corresponding node from the network. The data format for the device profile data is based on ASNI.1 "Abstract Syntax Notation One" conversion rules for transmission encoding as stipulated in ASNI.1 "Basic Encoding Rules (ISO/IEC 8825).

Item	Request	Response
Transaction code	65011	65211
Parameter	• Target node number	—
User data	—	• System parameters

<Device profile data>

	• Common specifications version
System parameter	• Identifier character string
	• Revision number
	• Revision data
	• Device classification
	• Vendor name
	• Product number
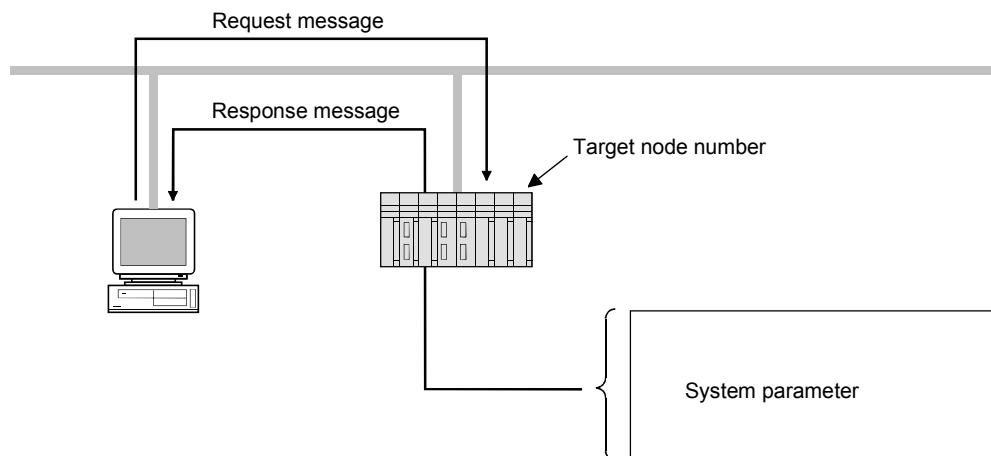
(e)   Log information read
Message function for reading corresponding node log information from the network.

Item	Request	Response
Transaction code	65013	65213
Parameter	• Target node number	—
User data	—	• Send and Receive log • Frame log • Cyclic transmission error log • Message transmission error log • ACK error log • Token error log • Status data • Join node list
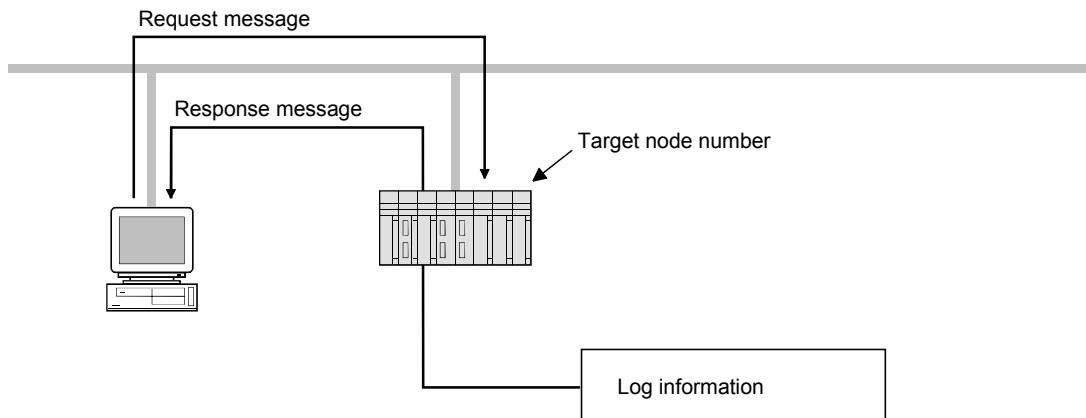
(f)   Log information clear
Message function for clearing corresponding node log information from the network.

Item	Request	Response
Transaction code	65014	65214
Parameter	• Target node number	—
User data	—	—
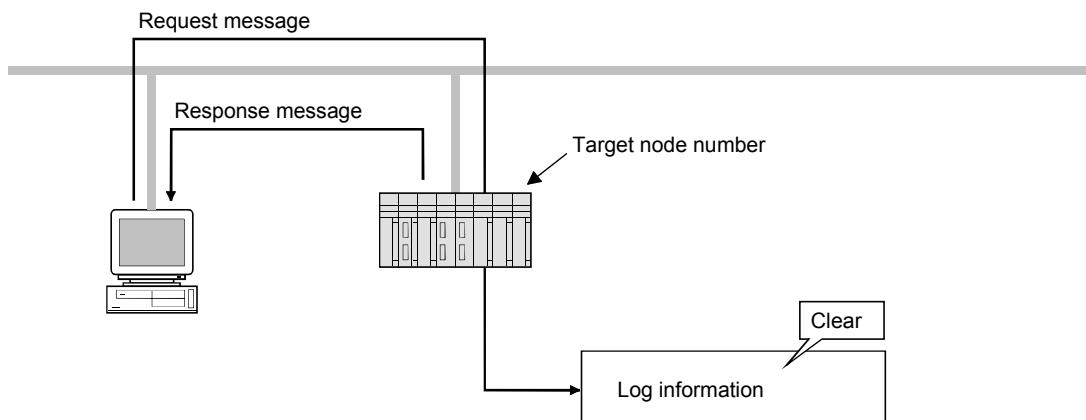
(g) Message return

This function returns the received message.

The returning is performed automatically within the FL-net module.

Item	Request	Response
Transaction code	65015	65215
Parameter	• Target node number	—
User data	Test data (1024 bytes)	Test data (1024 bytes)

Request message

Response message

Target node number
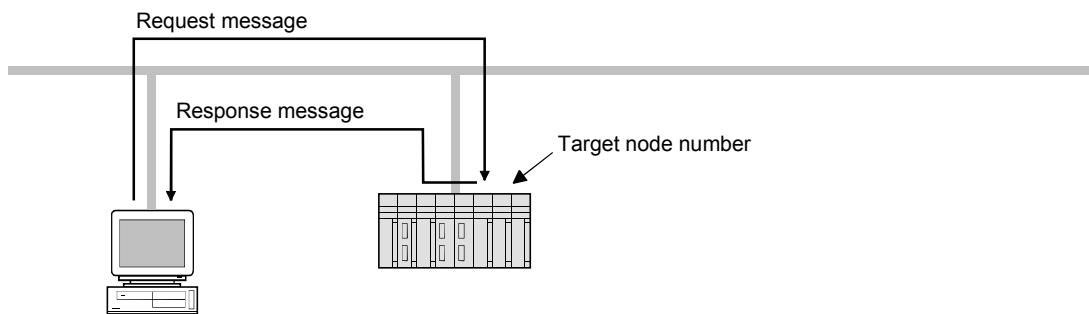
(h) Transparent type message transmission

This function writes messages to the corresponding node received message area from the network.

When a response message is required, create it with sequence program since FL-net module does not send it.

Request message

Target node number

16 bit

0

Receive message area

Item	Request	Response
Transaction code	• For the QJ71FL71-T-F01, QJ71FL71-B5-F01, and QJ71FL71-B2-F01, 0 to 59999 65000 to 65535 $*^1$ • For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2, 0 to 59599 65000 to 65535 $*^1$ (Function version A: 0 to 9999)	—
Parameter	• Target node number • Data size (word/byte unit) $*^2*^3$ • Response message classification • Virtual address space 　• Address 　• Size (word/byte unit) $*^4$	—
User data	Data (1024 byte space)	—

$*1$: Refer to Section 6.2.8 (3) "Transaction codes" for information on codes used by the system.

$*2$: Since there is no discrimination of transaction codes for the request frame and response frame, user must define them.

$*3$: If the object destination is using Version A, use word units. (Version A is not compatible with byte units.)

$*4$: Size depends on transaction code.

POINT
Since there is no discrimination of transaction codes for the request frame and response frame, user must define them.

6.3 Setting the FL-net Module

This section explains the procedures and setting methods up to the operation of the FL-net module.

6.3.1 Procedures up to operation

The following is a summary of the procedures up to operation.

```
                    ┌──────────────┐
                    │    Start     │
                    └──────┬───────┘
                           │
          ┌────────────────▼────────────────┐
          │ Mounting the FL-net module to    │
          │ the base unit.                   │
          └────────────────┬────────────────┘
                           │
          ┌────────────────▼────────────────┐
          │ Connecting the FL-net module to  │ ······ Refer to Section 5.1 "Communication cable connections"
          │ an Ethernet network.             │
          └────────────────┬────────────────┘
                           │
          ┌────────────────▼────────────────┐
          │ Connecting the GX Developer and  │
          │ QCPU to the cables.              │
          └────────────────┬────────────────┘
                           │
          ┌────────────────▼────────────────┐
          │ Setting the intelligent function │ ······ Refer to Section 6.3.2 "Settings from GX Developer"
          │ module switches used by the      │
          │ FL-net module using GX Developer. │
          └────────────────┬────────────────┘
                           │
          ┌────────────────▼────────────────┐
          │ Performing a self-diagnosis test │ ······ Refer to Section 6.3.1(1) "Self-diagnosis test"
          │ of the FL-net module.            │
          └────────────────┬────────────────┘
                           │
          ┌────────────────▼────────────────┐
          │ Using GX Developer to set the    │ ······ Refer to Section 6.3.1 "Settings from GX Developer"
          │ operating mode to "on line".     │
          └────────────────┬────────────────┘
                           │
          ┌────────────────▼────────────────┐
          │ Sending a PING command (*1) from │ ······ Refer to Section 8.2(3) "Checking for completion
          │ the corresponding communication  │         of the initial processing by "PING function"
          │ equipment to confirm the network │
          │ participation of the FL-net module. │
          └────────────────┬────────────────┘
                           │
                     ◇─────────────────◇
                    ╱ Is the GX Configurator-FL ╲──── NO ────┐
                    ╲        used?      ╱                    │
                     ◇─────────────────◇                     │
                           │                                 │
                          YES                                │
          ┌────────────────▼────────────────┐   ┌────────────▼─────────────┐
          │ Perform initialization setting   │   │ Create a program for     │ ··· Refer to Section 6.5
          │ and automatic refresh settings.  │   │ communications.          │     "Programming"
          └────────────────┬────────────────┘   └──────────────────────────┘
                           │
                    ┌──────▼───────┐
                    │   Operate    │
                    └──────────────┘
```

*1 : Note that the PING command cannot be sent from the FL-net module.

(1) Self-diagnosis test

This section explains the self-diagnosis test used for checking the send/receive functions and hardware components of the FL-net module.

(a) Self-loopback test

This section explains the self-loopback test for checking the hardware including the send/receive circuits of FL-net module.

A self-loopback test is one that check whether or not the FL-net module can receive the same message when an local station address transmission is sent to the line and received via the network.

Next, the procedure for the self-loopback test is explained. This test is performed in approximately 5 seconds. The test results are evaluated by using the LED on the front of the FL-net module.

Step	Operation		LED Status		
			[RUN]	[LNK]	[PER]
1	Connect the FL-net module to the line. (Refer to Section 5.1)		—	—	—
2	Stop the CPU module.		—	—	—
3	Use GX Developer to change the FL-net module operating mode to "2. Loopback test" and write the parameters to the CPU module. (Refer to Section 6.3.2)		—	—	—
4	Reset the CPU module.		●	●	○
5	After five (5) seconds, check the status of the LEDs.	When normal	●	○	○
		When error	●	○	●
6	Use GX Developer to change the FL-net module operating mode to "Online" or other test mode. (Refer to Section 6.3.2)		—	—	—
7	Reset the CPU module.		—	—	—

● : On ○ : Off

The following are possible causes of errors.
• FL-net module hardware error.
• FL-net (OPCN-2) line error
• External power supply 12 V DC error (10BASE5 only)

POINT

There is no hardware-type blockage by the corresponding equipment on line, even when the self-loopback test is performed. When the packets are crowding the line, packet collision may cause the test to take more than five seconds to complete. It such cases, perform this test after stopping the data communication among other equipment.

(b) Hardware test

This section introduces the RAM and ROM tests for the FL-net module.

The following are the steps for performing the hardware tests.

The test results are evaluated by using the LED in the front of the FL-net module.

Step	Operation		LED Status		
			[RUN]	[LNK]	[PER]
1	Stop the CPU module.		—	—	—
2	Use GX Developer to change the FL-net module operating mode to "3. Hardware test" and write the parameters to the CPU module. (Refer to Section 6.3.2)		—	—	—
3	Reset the CPU module.		●	●	○
4	After five (5) seconds, check the status of the LEDs	When normal	●	○	○
		When error	●	○	●
5	Use GX Developer to change the FL-net module operating mode to "Online" or other test mode. (Refer to Section 6.3.2)		—	—	—
6	Reset the CPU module.		—	—	—

● : On   ○ : Off

The following are possible causes of errors.

• FL-net module RAM/ROM error.

POINT
If the results of the hardware test show an error, perform the test again. If a repeat of the test shows that there may be an error with the hardware of the FL-net module, make detailed notes of the problem and then contact your nearest representative.

6.3.2 Setting the GX Developer

This section explains the settings on GX Developer to operate FL-net module.
Refer to the operating manual for the GX Developer for details about the screen
displays.   For multiple CPU systems, refer to QCPU User's Manual (Multiple CPU
System).

(1)   I/O assignment
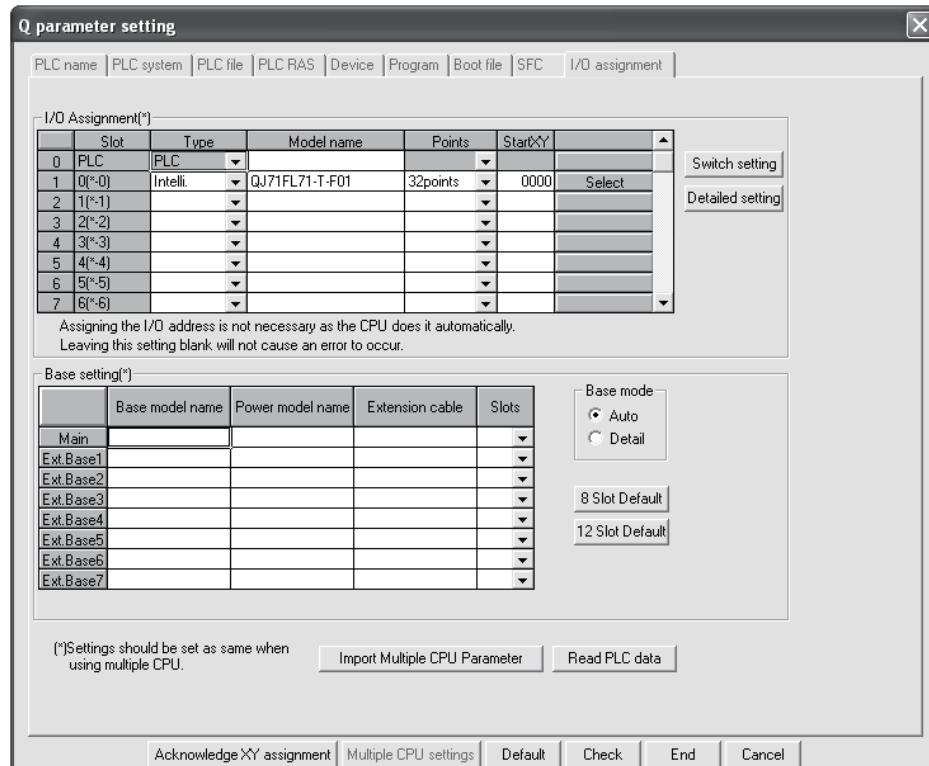
Item	Contents
Type	Select "Intelli."
Model name	Input the model name of the module.
Points	Select "32 points"
StartXY	Input the start input/output number of the FL-net module.

(2) Intelligent function module switch setting

	Slot	Type	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0	PLC	PLC No.1						
1	PLC	PLC No.2						
2	1(*-1)	Intelli.	QJ71FL71-T-F01	192	168	250	1	0
3	2(*-2)	Intelli.	QJ71FL71-T-F01	192	168	250	2	0
4	3(*-3)							
5	4(*-4)							
6	5(*-5)							
7	6(*-6)							
8	7(*-7)							
9	8(*-8)							
10	9(*-9)							
11	10(*-10)							
12	11(*-11)							
13	12(*-12)							
14	13(*-13)							
15	14(*-14)							

Switch setting for I/O and intelligent function module — Input format DEC.

End   Cancel
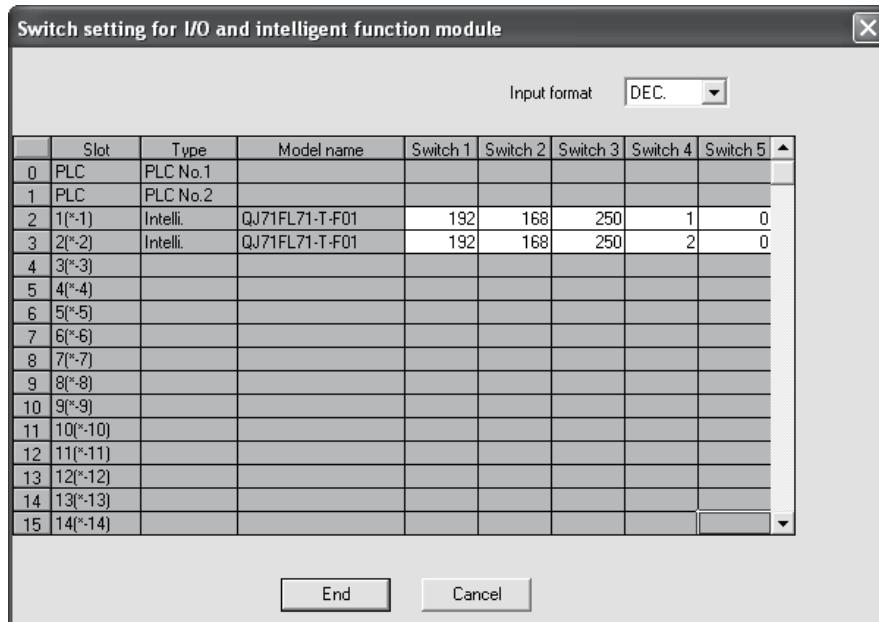
(a) Switch 1 to switch 4
Sets the IP address of the FL-net module.
Consult with the network manager (the person who plans the network or manages the IP addresses) about the IP address and set so that is no duplication with remote nodes.

1) Switch 1
Set the first digit of the IP address.
If set to "No setting (Blank)", the default setting is used.
• Default value : 192

POINT

FL-net (OPCN-2) uses Class C IP address.
Setting values can be set within a range from 192 to 223.

---

2) Switch 2
Set the second digit of the IP address.
If set to "No setting (Blank)", the default setting is used.
• Default value : 168
• Setting range : 0 to 255

3) Switch 3
Set the third digit of the IP address.
If set to "No setting (Blank)", the default setting is used.
• Default value : 250
• Setting range : 0 to 255

4) Switch 4
Set the fourth digit of the IP address. (This is the node number.)
If set to "No setting (Blank)", the default setting is used.
• Default value : 1
• Setting range : 1 to 254

(b)   Switch 5

Enter the operating mode of the FL-net module.

Setting value	Items	Description
0	Online (10Mbps, half duplex)	Communicates with other nodes. (Default)
1	Offline	Disconnects its own node from the network.
2	Loopback test	Performs a self-diagnostics test.
3	Hardware test	Tests the RAM and ROM.
4	Online (Auto negotiation)	Communicates with other nodes. (Mode to be selected when using 100Mbps, the QJ71FL71-T-F01 only)

(c)   Input format

Select the input format for the settings.

• Decimal

• Hexadecimal (default)

REMARK

When connecting to the network, set the operation mode of the FL-net module to "Online" on the Intelligent function module switch setting screen. After writing the settings to programmable controllers and when the CPU is reset, the preparations for the FL-net module is complete.

Confirmation that preparations have been completed can be performed by using the module ready (X1C).

ON : Preparations completed

OFF : Intelligent function module switch setting error

If the module ready (X1C) was left off, reset the intelligent function module switches again.

(3) Detailed settings (I/O module, intelligent function module detailed setting screen)
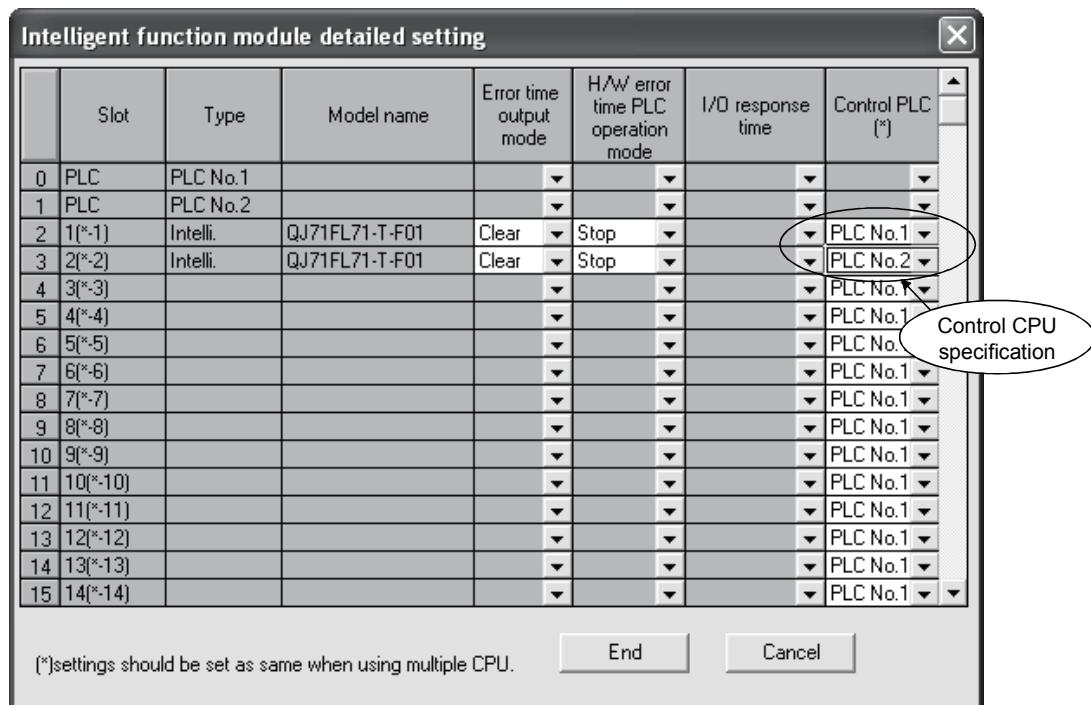
(a) Error time output mode
    Select the output mode during errors.
    • Default: "Clear"

(b) H/W error time PLC operation mode
    Select the CPU operating mode during hardware error.
    • Default: "Stop"

(c) Control PLC
    Set the control CPU for FL-net module with multiple CPU system.
    • Default: "PLC No. 1"

REMARK

For multiple CPU systems, refer to QCPU User's Manual (Multiple CPU System).

6.4 GX Configurator-FL

6.4.1 Functions of GX Configurator-FL

Table 6.1 lists the functions of GX Configurator-FL.

Table 6.1 GX Configurator-FL function list

Function	Description	Reference section
Initial settings *1	(1) Sets items for the local node network parameter area, which require initial settings. (2) The data that has been initially set is registered in the parameters for the CPU module and when the CPU is set to run status, it is automatically written to the FL-net module.	6.4.8
Auto refresh	(1) Sets the following areas for automatic refresh: status data bit area for the buffer memory of the FL-net module, status data word area and cyclic data area. (2) The buffer memory of the FL-net module that has been set by automatic refresh will automatically read and write to the designated device automatically when the END instruction for the CPU module is executed.	6.4.9
Monitoring/test	(1) Monitoring - test The buffer memory and I/O signals of the FL-net module are monitored or tested. (2) Status data area Monitors the status data area data. (3) Local/other node network parameter data Monitors local/other node network parameter data.	6.4.10

POINT

*1) Precaution for initial settings
If new initial settings are performed at the GX Configurator-FL side on a system which had its initial settings performed by sequence program previously, the initial settings by the GX Configurator-FL will not be enabled.

6.4.2 Installing and uninstalling GX Configurator-FL

For how to install or uninstall the utility package, refer to "Method of installing the MELSOFT Series" included in the utility package.

6.4.3 Handling precautions

The following explains the precautions on using the GX Configurator-FL.

(1) For safety
Since GX Configurator-FL is add-in software for GX Developer, read "Safety Precautions" and the basic operating procedures in the GX Developer Operating Manual.

(2) About installation
GX Configurator-FL is add-in software for GX Developer Version 4 or later. Therefore, GX Configurator-FL must be installed on the personal computer that has already GX Developer Version 4 or later installed.

(3) Screen error of Intelligent function module utility
Insufficient system resource may cause the screen to be displayed inappropriately while using the Intelligent function module utility.
If this occurs, close the Intelligent function module utility, GX Developer (program, comments, etc.), and other applications, and then start GX Developer and Intelligent function module utility again.

(4) To start the Intelligent function module utility

(a) In GX Developer, select "QCPU (Q mode)" for PLC series and specify a project.
If any PLC series other than "QCPU (Q mode)" is selected, or if no project is specified, the Intelligent function module utility will not start.

(b) Multiple Intelligent function module utilities can be started.
However, [Open parameters] and [Save parameters] operations under [Intelligent function module parameter] are allowed for one Intelligent function module utility only. Only the [Monitor/test] operation is allowed for the other utilities.

(5) Switching between two or more Intelligent function module utilities
When two or more Intelligent function module utility screens cannot be displayed side by side, select a screen to be displayed on the top of others using the task bar.

(6) Number of parameters that can be set in GX Configurator-FL

When multiple intelligent function modules are mounted, the number of parameter settings must not exceed the following limit.

When intelligent function modules are installed to:	Maximum number of parameter settings	
	Initial setting	Auto refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/Q25HCPU	512	256
Q02PH/Q06PH/Q12PH/Q25PHCPU	512	256
Q12PRH/Q25PRHCPU	512	256
Q00UJ/Q00U/Q01UCPU	512	256
Q02UCPU	2048	1024
Q03UD/Q04UDH/Q06UDH/Q10UDH/ Q13UDH/Q20UDH/Q26UDH/Q03UDE/ Q04UDEH/Q06UDEH/Q10UDEH/ Q13UDEH/Q20UDEH/Q26UDEHCPU	4096	2048
Q50UDEH/Q100UDEHCPU	Cannot be used	Cannot be used
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed to the MELSECNET/H remote I/O station, configure the settings in GX Configurator so that the number of parameter settings for all the intelligent function modules does not exceed the limit of the MELSECNET/H remote I/O station.
Calculate the total number of parameter settings separately for the initial setting and for the auto refresh setting.
The number of parameters that can be set for one module in GX Configurator-FL is as shown below.

Target Module	Initial setting	Auto refresh setting
FL-net module	2 (Fixed)	14 (Max.)

(Example) Counting the number of parameter settings in the Auto refresh setting
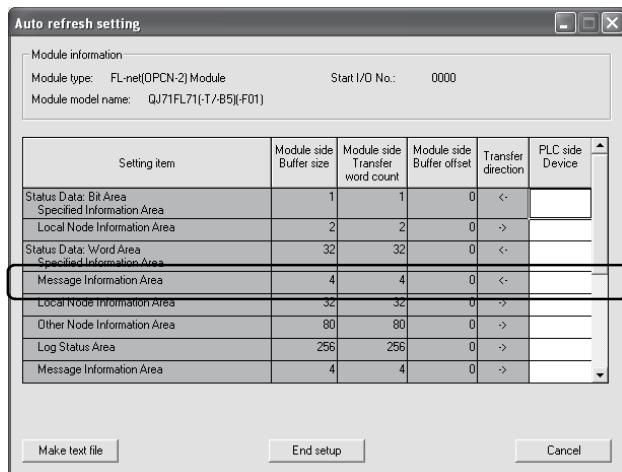
This one row is counted as one setting.
Blank rows are not counted.
Count up all the setting items on this screen, and add the total to the number of settings for other intelligent function modules to get a grand total.

6.4.4 Operating environment

This section explains the operating environment of the personal computer that runs GX Configurator-FL.

Item		Description
Installation (Add-in) target *1		Add-in to GX Developer Version 4 (English version) or later. *2
Computer		Personal computer compatible with the operating system listed below
	CPU	Refer to the following table, "Operating system and performance required for personal computer".
	Required memory	
Hard disk space	For installation	65 MB or more
	For operation	10 MB or more
Display		800 × 600 dots or more resolution *3
Operating system		Microsoft® Windows® 95 Operating System (English version)
		Microsoft® Windows® 98 Operating System (English version)
		Microsoft® Windows® Millennium Edition Operating System (English version)
		Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version)
		Microsoft® Windows® 2000 Professional Operating System (English version)
		Microsoft® Windows® XP Professional Operating System (English version)
		Microsoft® Windows® XP Home Edition Operating System (English version)
		Microsoft® Windows Vista® Home Basic Operating System (English version)
		Microsoft® Windows Vista® Home Premium Operating System (English version)
		Microsoft® Windows Vista® Business Operating System (English version)
		Microsoft® Windows Vista® Ultimate Operating System (English version)
		Microsoft® Windows Vista® Enterprise Operating System (English version)
		Microsoft® Windows® 7 Starter Operating System (English version) *4
		Microsoft® Windows® 7 Home Premium Operating System (English version) *4
		Microsoft® Windows® 7 Professional Operating System (English version) *4
		Microsoft® Windows® 7 Ultimate Operating System (English version) *4
		Microsoft® Windows® 7 Enterprise Operating System (English version) *4

*1: Install GX Configurator-FL in GX Developer Version 4 or higher in the same language.
   GX Developer (English version) and GX Configurator-FL (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-FL (English version) cannot be used in combination.
*2: GX Configurator-FL is not applicable to GX Developer Version 3 or earlier.
*3: Resolution of 1024 X 768 dots or more is recommended for Windows Vista® or Windows® 7.
*4: To use Windows® 7 (32-bit), install GX Configurator-FL Version 1.25AB or later in GX Developer Version 8.91V or later.
   To use Windows® 7 (64-bit), install GX Configurator-FL Version 1.25AB or later in GX Developer Version 8.98C or later.

Operating system and performance required for personal computer

Operating system	Performance required for personal computer	
	CPU	Memory
Windows® 95	Pentium® 133MHz or more	32MB or more
Windows® 98	Pentium® 133MHz or more	32MB or more
Windows® Me	Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0	Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional	Pentium® 133MHz or more	64MB or more
Windows® XP	Pentium® 300MHz or more	128MB or more
Windows Vista®	Pentium® 1GHz or more	1GB or more
Windows® 7	Pentium® 1GHz or more	1GB or more (for 32-bit)
		2GB or more (for 64-bit)

POINT

• Do not use the functions shown below when using Windows® XP, Windows Vista® ,
  and Windows® 7.
  The functions shown below are not available for Windows® XP and Windows Vista® .
  If any of the following functions is attempted, this product may not operate normally.
      Start of application in Windows® compatible mode
      Fast user switching
      Remote desktop
      Large fonts (Details setting of Display Properties)
      DPI setting other than 100%
   Windows® XP (64-bit) and Windows Vista® (64-bit) are not available.
• For Windows Vista® or Windows® 7, a user with USER authorization or higher is
  allowed to use it.
• Do not use the functions shown below when using Windows® 7.
  If any of the following functions is attempted, this product may not operate normally.
      Windows XP Mode
      Windows Touch

6.4.5 Common GX Configurator-FL operations

(1)   Control keys

Special keys that can be used for operation of GX Configurator-FL and their applications are shown in the table below.

Key	Application
Esc	Cancels the current entry in a cell. Closes the window.
Tab	Moves between controls in the window.
Ctrl	Used in combination with the mouse operation to select multiple cells for test execution.
Delete	Deletes the character where the cursor is positioned. When a cell is selected, clears all of the setting contents in the cell.
Back Space	Deletes the character where the cursor is positioned.
↑ ↓ ← →	Moves the cursor.
Page Up	Moves the cursor one page up.
Page Down	Moves the cursor one page down.
Enter	Completes the entry in the cell.

(2) Data created with GX Configurator-FL
The following data or files that are created with GX Configurator-FL can be also
handled in GX Developer. Figure 6.1 shows respective data or files are handled
in which operation.

<Intelligent function module parameter>

(a) This represents the data created in Auto refresh setting, and they are stored
in an intelligent function module parameter file in a project created by GX
Developer.

```
Project
    ├──Program
    ├──Parameter
    │      ├──PLC parameter
    │      ├──Network parameter
    │      └──Intelligent Function Module Parameter
```
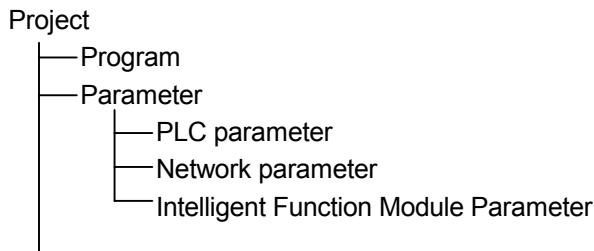
(b) Steps 1) to 3) shown in Figure 6.1 are performed as follows:

1) From GX Developer, select:
    [Project] → [Open project] / [Save] / [Save as]

2) On the intelligent function module selection screen of the utility, select:
    [Intelligent function module parameter] → [Open parameters] / [Save
    parameters]

3) From GX Developer, select:
    [Online] → [Read from PLC] / [Write to PLC] → "Intelligent function
    module parameters"
    Alternatively, from the intelligent function module selection screen of
    the utility, select:
    [Online] → [Read from PLC] / [Write to PLC]

<Text files>

(a) A text file can be created by clicking the | Make text file | button on the initial setting, Auto refresh setting, or Monitor/Test screen. The text files can be utilized to create user documents.
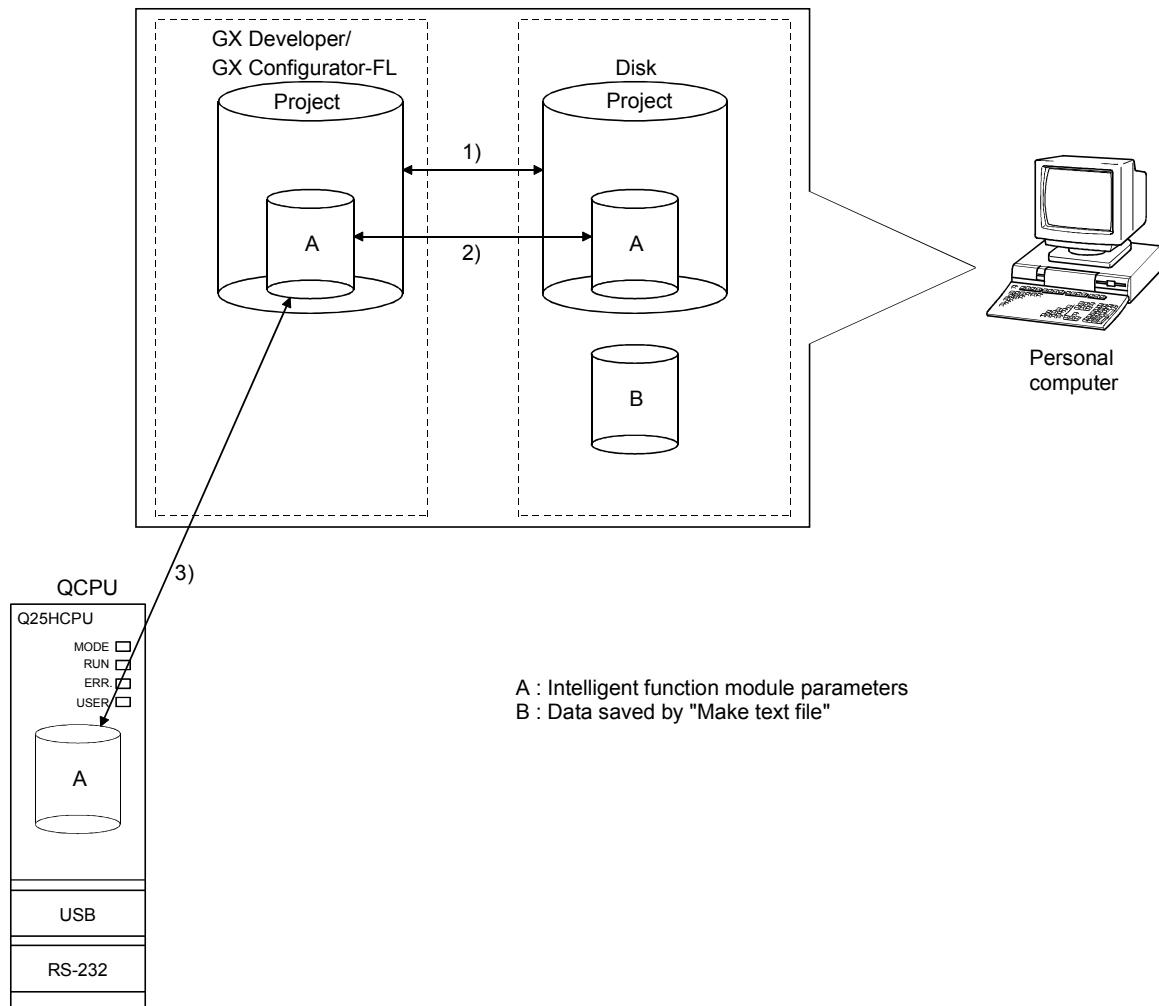
A : Intelligent function module parameters
B : Data saved by "Make text file"

Fig. 6-1 Correlation chart for data created with GX Configurator-FL

6.4.6 Operation overview

GX Developer screen

- [LD(Edit mode)   MAIN   35 Step]

Tools   Window   Help

Check program ...
Merge data ...
Check parameter ...
Transfer ROM
Delete unused comments
Clear all parameters ...
IC memory card
Start ladder logic test
Set TEL data
Intelligent function utility   Utility list ...
Customize keys ...   Start
Change display color ...
Options ...
Create start-up setting file ...

[Tool] - [Intelligent function utility] - [Start]
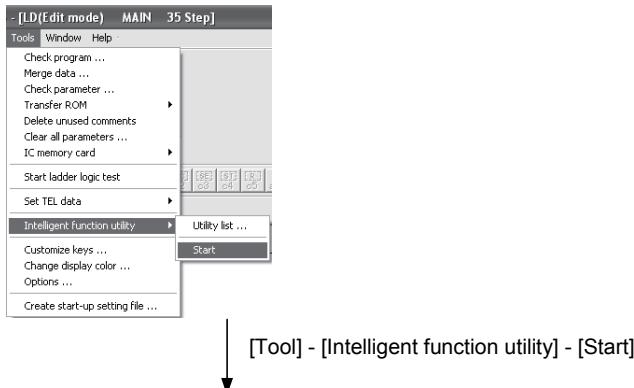
Screen for selecting a target
intelligent function module

Intelligent function module utility C:\MELSEC\GPPW\FLE

Intelligent function module parameter   Online   Tools   Help

Select a target intelligent function module.

Start I/O No.   Module type
        0000   FL-net(OPCN-2) Module

                       Module model name
                       QJ71FL71(-T/-B5)(-F01)

Parameter setting module
Intelligent function module parameter

Start I/O No.	Module model name	Initial setting	Auto refresh
0000	QJ71FL71(-T/-B5)(-F01)	Available	Available

Initial setting   Auto refresh   Delete   Exit

Refer to Section 6.4.7

Enter "Start I/O No.", and select "Module type" and
"Module model name".

1)

Initial settings

Auto refresh

Initial setting screen

Auto refresh setting screen

Initial setting

Module information
Module type: FL-net(OPCN-2) Module   Start I/O No.:   0000
Module model name: QJ71FL71(-T/-B5)(-F01)

Setting item	Setting value
Node Name *Number of characters possible to set :9 characters*	
Common Memory: Area1 Start Address	0000
Area1 Size	0000
Common Memory: Area2 Start Address	0000
Area2 Size	0000
Token Watch Time Out Time(Units:ms)	50
Minimum Permissible Frame Duration(Units:100us)	0

Details
Character string input
Number of setting available character
9

Make text file   End setup   Cancel

Refer to Section 6.4.8

Auto refresh setting

Module information
Module type: FL-net(OPCN-2) Module   Start I/O No.:   0000
Module model name: QJ71FL71(-T/-B5)(-F01)

Setting item	Module side Buffer size	Module side Transfer word count	Module side Buffer offset	Transfer direction	PLC side Device
Status Data: Bit Area Specified Information Area	1	1	0	<-	
Local Node Information Area	2	2	0	->	
Status Data: Word Area Specified Information Area	32	32	0	<-	
Message Information Area	4	4	0	<-	
Local Node Information Area	32	32	0	->	
Other Node Information Area	80	80	0	->	
Log Status Area	256	256	0	->	
Message Information Area	4	4	0	->	

Make text file   End setup   Cancel

Refer to Section 6.4.9.

1) ──────────────────────────────

[Online] - [Monitor/Test]

Selecting monitor/test module screen

Select a module to be monitored/tested.

Monitor/Test

Monitor/Test screen

Refer to Section 6.4.10

6.4.7 Starting the Intelligent function module utility

[Operating procedure]

Intelligent function module utility is started from GX Developer.

[Tools] → [Intelligent function utility] → [Start]

[Setting screen]
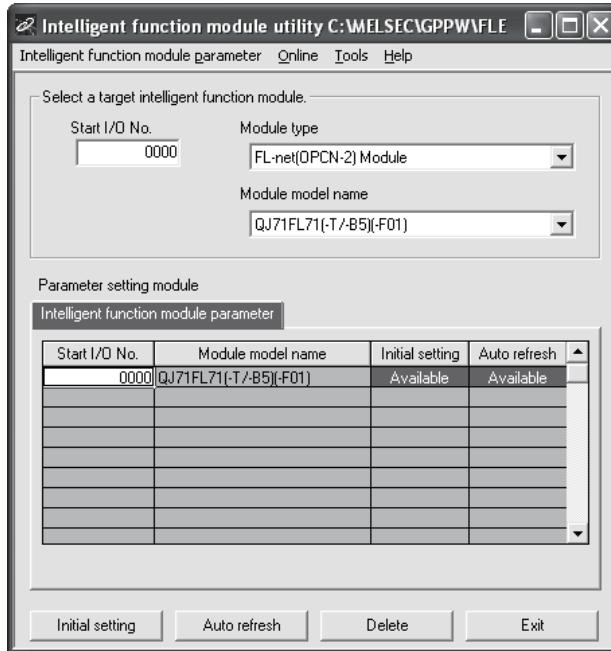
[Explanation of items]

(1) Activation of other screens

Following screens can be displayed from the intelligent function module utility screen.

(a) Initial setting screen

"Start I/O No.[*1]"→"Module type"→"Module model name"→ | Initial setting |

(b) Auto refresh setting screen

"Start I/O No.[*1]"→"Module type"→"Module model name"→ | Auto refresh |

(c) Select monitor/test module screen

[Online] → [Monitor/Test]

*1: Enter the start I/O No. in hexadecimal.

(2) Command buttons

| Delete | Deletes the initial setting and auto refresh setting of the selected module.

| Exit | Closes this screen.

(3) Menu bar

    (a) File menu
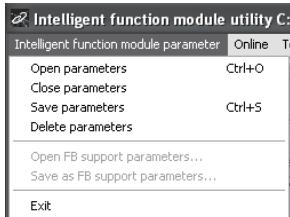
        Intelligent function module parameters of the project opened by GX Developer are handled.

        [Open parameters]   : Reads a parameter file.

        [Close parameters] : Closes the parameter file. If any data are modified, a dialog asking for file saving will appear.

        [Save parameters] : Saves the parameter files.

        [Delete parameters] : Deletes the parameter file.

        [Exit]   : Closes this screen.

    (b) Online menu
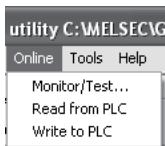
        [Monitor/Test]   : Activates Select monitor/test module screen.

        [Read from PLC]   : Reads intelligent function module parameters from the CPU module.

        [Write to PLC]   : Writes intelligent function module parameters to the CPU module.

POINT

(1) Saving intelligent function module parameters in a file

Since intelligent function module parameters cannot be saved in a file by the project saving operation of GX Developer, save them on the shown module selection screen.

(2) Reading/writing intelligent function module parameters from/to a programmable controller using GX Developer

    (a) Intelligent function module parameters can be read from and written into a programmable controller after having been saved in a file.

    (b) Set a target programmable controller CPU in GX Developer: [Online] → [Transfer setup].

    (c) When mounting an FL-net module to a remote I/O station, use [Read from PLC] and [Write to PLC] of GX Developer.

(3) Checking the required utility

While the start I/O is displayed on the Intelligent function module utility setting screen, "＊" may be displayed for the model name.

This means that the required utility has not been installed or the utility cannot be started from GX Developer.

Check the required utility, selecting [Tools] - [Intelligent function utility] - [Utility list...] in GX Developer.

6.4.8 Initial setting

[Purpose]
The local node network parameter area is set.
This setting eliminates the need for creating a sequence program shown in Section 6.5.1.

[Operating procedure]
"Start I/O No.*" → "Module type" → "Module model name" → Initial setting

＊ Enter the start I/O No. in hexadecimal.

[Setting screen]
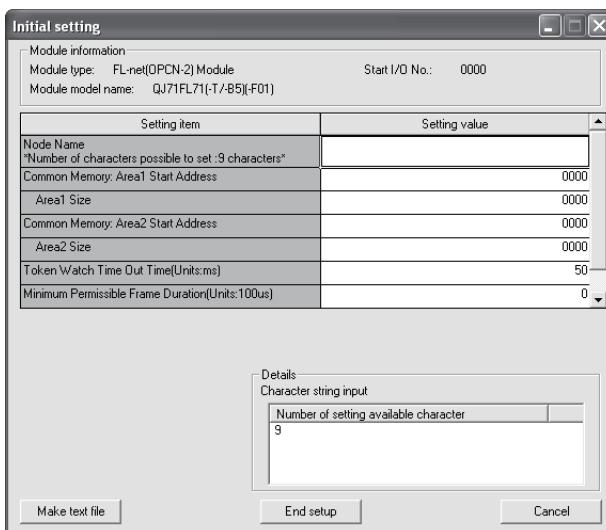
[Explanation of items]
(1) Setting items
Set data formats and permissible setting values for respective items in Setting value fields, and click the End setup button to enter the settings.

Item		Buffer memory address (Hex.)	Reference section
Node Name		0 to 4H	
Common Memory	Area 1 Start Address	8H	
	Area 1 Size	9H	
	Area 2 Start Address	AH	
	Area 2 Size	BH	3.2.5 (3)
Token Watch Time Out Time (Units: ms)		CH	
Minimum Permissible Frame interval (Units: 100us)		DH	
Message Data Unit Select		EH	

(2) Introduction of command buttons

| Make text file | Creates a file containing the screen data in text file format. |

| End setup | Saves the set data and ends the operation. |

| Cancel | Cancels the setting and ends the operation. |

POINT

This initial setting is stored in the intelligent function module parameters.
After being written to the CPU module, the initial settings are enabled by either of
the following operation (1) or (2).
  (1) Turn the RUN/STOP switch of the CPU module from STOP → RUN → STOP
      → RUN.
  (2) After setting the RUN/STOP switch to RUN, turn the power OFF and then ON
      or reset the CPU module.
When the contents of the initial settings are written by the sequence program, the
values of the initial setting parameters are written when the CPU module changes
from STOP status to RUN status. Accordingly, program the sequence program so
that the initial settings are re-executed.

6.4.9 Auto refresh setting

[Purpose]

This setting is made for automatic data transfer between the FL-net module buffer memory and the programmable controller CPU devices.
By this setting, cyclic data can be automatically transferred between the FL-net module and programmable controller CPU devices.

[Operating procedure]

"Start I/O No.*" → "Module type" → "Module model name" → $\boxed{\text{Auto refresh}}$

✳ Enter the start I/O No. in hexadecimal.

[Setting screen]
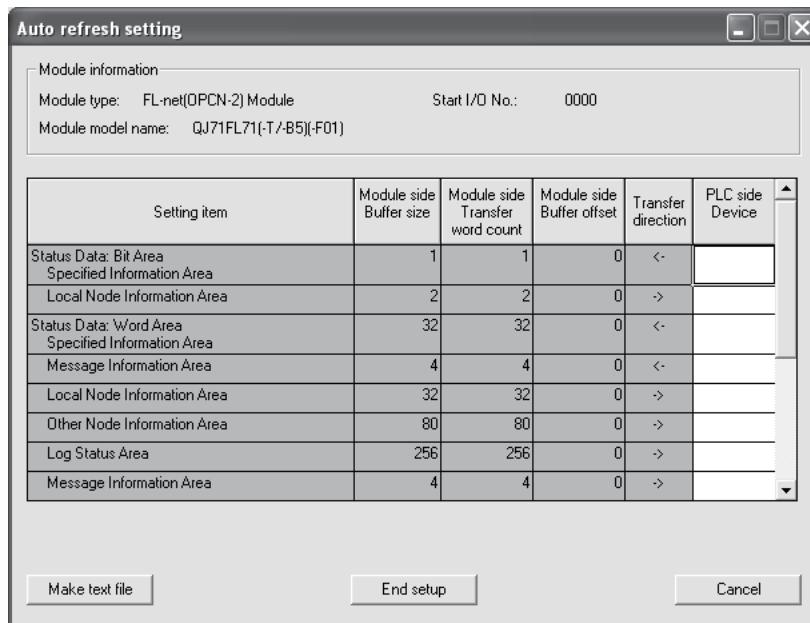
[Explanation of items]
(1) Setting items

Item		Buffer memory address (Hex.)	Reference section
Status Data: Bit Area	Specified Information Area	900H	3.2.6 (1)(a)
	Local Node Information Area	904 to 905H	3.2.6 (1)(b)
Status Data: Word Area	Specified Information Area	980 to 99FH	3.2.6 (2)(a)
	Message Information Area	9A0 to 9A3H	3.2.6 (2)(b)
	Local Node Information Area	9C0 to 9DFH	3.2.6 (2)(c)
	Other Node Information Area	9E0 to A2FH	3.2.6 (2)(d)
	Log Status Area	A80 to B7FH	3.2.6 (2)(e)
	Message Information Area	C00 to C03H	3.2.6 (2)(f)
Cyclic Data: Area 1	Local Node Area	1C00 to 1DFFH	3.2.5 (3)(g) This section (4)
	Other Node Area		
	Other Node Area		
Cyclic Data: Area 2	Local Node Area	2000 to 3FFFH	
	Other Node Area		
	Other Node Area		

(2)   Contents of screen display
   (a)   Setting method
      1)   Auto-refresh items
         Enter the CPU side device data as the auto refresh target.
         For cyclic data, also enter the number of words to be transferred to the
         PLC side devices and offset values of the buffer memory addresses.

      2)   Non-auto-refresh items
         Leave the "PLC side Device" field blank.
         In the "Module side Transfer word count" field, enter 1 or larger value
         (a dummy value).

   (b)   Setting items

Item	Description
Module side Buffer size	Displays the buffer memory size for each setting item.
Module side Transfer word count (Enter in decimal)	Set the number of data transferred between the module side buffer memory and the CPU side devices in units of words.
Module side Buffer offset (Enter in decimal)	Set the transfer destination of the module side buffer memory with an offset value from the start address of each setting item.
Transfer direction	Shows the data transfer direction. | <- | : Module side buffer memory ← PLC side device | -> | : Module side buffer memory → PLC side device
PLC side Device	Set the start device on the CPU side to which data are transferred. Applicable devices are as follows: • CPU module: X, Y, M, L, B, T, C, ST, D, W, R, ZR • MELSECNET/H remote I/O station: X, Y, M, B, D, W When using bit device X, Y, M, L or B, set a number divisible by 16 points (e.g. X10, Y120, M16). Buffer memory data are stored into an area of 16 points starting from the specified device number. For example, if X10 is set, data are stored in X10 to X1F.

POINT

If the local node area is set to the first or last in the cyclic data area, other node
areas are not divided into two. Since other node areas need to be set in two
different parts, enter 1 or larger value for the second other node area field of
"Module side Transfer word count" as a dummy value even if it is not required for
control.

(3) Command buttons

Make text file	Creates a file containing the screen data in text file format.
End setup	Saves the set data and ends the operation.
Cancel	Cancels the setting and ends the operation.

> **POINT**
>
> The auto refresh settings are stored in an intelligent function module parameter file.
> After writing the intelligent function module parameter to the CPU module, the auto refresh settings are enabled by setting the RUN/STOP switch to STOP → RUN → STOP → RUN or by the resetting of the CPU module.
> The auto refresh settings cannot be changed from sequence programs. However, processing equivalent to auto refresh can be added using the FROM/TO instruction in the sequence program.

(4) Cyclic data area setting example

The following shows a setting example of the cyclic data area (area 1) when the local node is node 3.
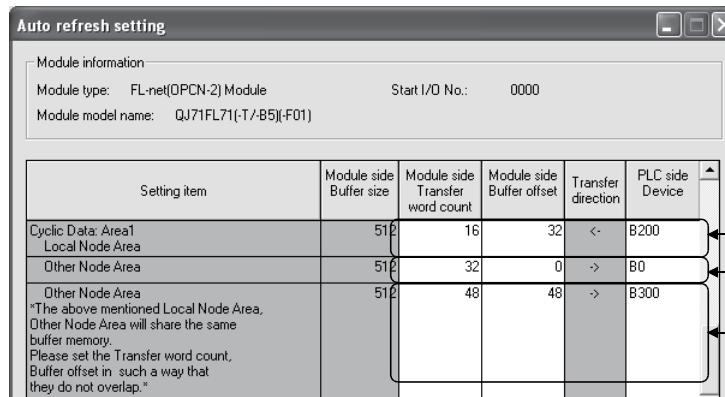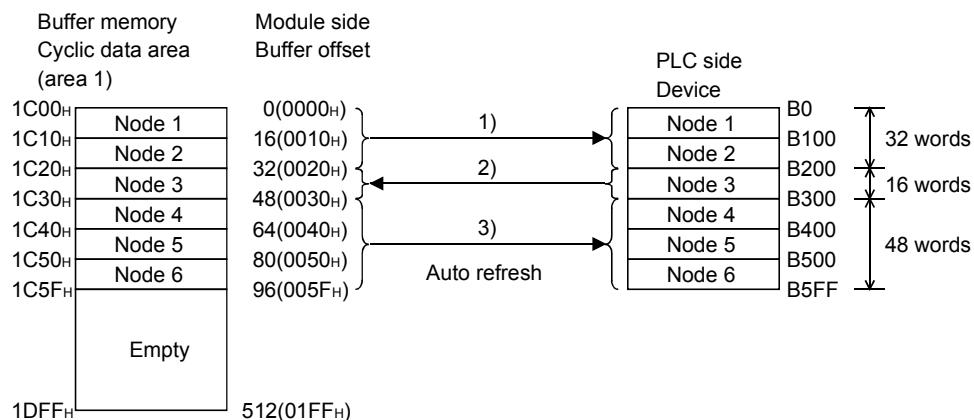
6.4.10 Monitoring/Test

[Purpose]

Start buffer memory monitoring/testing, I/O signal monitoring/testing and local/remote node parameter data monitor from this screen.

[Operating procedure]

"Select monitor/test module" screen → "Start I/O No.*" → "Module type" → "Module model name" → [Monitor/test]

＊ Enter the start I/O No. in hexadecimal.

The screen can be started from System monitor of GX Developer Version6 or later.

Refer to the GX Developer Operating Manual for details.

[Setting screen]

X/Y monitor screen

Status data (bit area) local node information monitor screen

1)

Refer to Section 3.2.4

Refer to Section 3.2.6(1)(b)

Refer to Section 3.2.6(2)(a)

Refer to Section 3.2.6(2)(c)

Status data (word area)
Instruct information monitor screen

Status data (word area) local
node information monitor screen

1) ◄──► 2)

Status data (bit area)
message status monitor area

Refer to Section 3.2.6(1)(b)

Refer to Section 3.2.6(2)(b)

Refer to Section 3.2.6(2)(b)

Status data (word area)
other node information :
CPU RUN status monitor screen

Status data (word area)
other node information : CPU status 1
(WARNING) monitoring screen

2)

3)

Status data (word area)
other node information :
Join node list monitor screen

Status data (word area)
other node information : parameter
communication result monitor screen

Refer to Section 3.2.6(2)(b)

Refer to Section 3.2.6(2)(b)

Local Node Parameter Information Monitor

Module information

Module type: FL-net(OPCN-2) Module   Start I/O No.:   0000

Module model name: QJ71FL71(-T/-B5)(-F01)

Setting item	Current value	Setting value
Node Name		
IP Address	C0A8FA01	
Common Memory: Area1 Start Address	0000	
Area1 Size	0000	
Common Memory: Area2 Start Address	0000	
Area2 Size	0000	
Token Watch Time Out Time(Units:ms)	50	
Minimum Permissible Frame Duration(Units:100us)	0	
Message Data Unit Select	Word Units	

Flash ROM setting: Write to module / Save file / Current value display / Read from module / Load file / Make text file

Details   Monitoring   Cannot execute test

Start monitor   Stop monitor   Execute test   Close

Refer to Section 3.2.5(3)(a)

Other Node Parameter Info. Monitor: Node No.1

Module information

Module type: FL-net(OPCN-2) Module   Start I/O No.:   0000

Module model name: QJ71FL71(-T/-B5)(-F01)

Setting item	Current value	Setting value
Common Memory: Area1 Start Address	0000	
Area1 Size	0000	
Common Memory: Area2 Start Address	0000	
Area2 Size	0000	
Token Watch Time Out Time(Units:ms)	0	
Minimum Permissible Frame Duration(Units:100us)	0	
Refresh Cycle Permissible Time RCT Setting Value (Units:ms)	0	
Upper Layer Link Status: Node Status	Leave	
Upper Layer Operating Signal	Normal	
Common Memory Data	Invalid	

Flash ROM setting: Write to module / Save file / Current value display / Read from module / Load file / Make text file

Details   Monitoring   Cannot execute test

Start monitor   Stop monitor   Execute test   Close

Refer to Section 3.2.5(3)(b)

Local node parameter information monitor screen

Other node parameter info. monitor screen

3)

Status data (word area) other node information : CPU status 2 (ALARM) monitor screen

Status data (word area) error log information monitor screen

CPU Status2(ALARM) Monitor

Module information

Module type: FL-net(OPCN-2) Module   Start I/O No.:   0000

Module model name: QJ71FL71(-T/-B5)(-F01)

Setting item	Current value	Setting value
CPU Status2(ALARM) Node 1	NORMAL	
Node 2	NORMAL	
Node 3	NORMAL	
Node 4	NORMAL	
Node 5	NORMAL	
Node 6	NORMAL	
Node 7	NORMAL	
Node 8	NORMAL	
Node 9	NORMAL	
Node 10	NORMAL	

Flash ROM setting: Write to module / Save file / Current value display / Read from module / Load file / Make text file

Details   Monitoring   Cannot execute test

Start monitor   Stop monitor   Execute test   Close

Refer to Section 3.2.6(2)(d)

Error Log Information Monitor

Module information

Module type: FL-net(OPCN-2) Module   Start I/O No.:   0000

Module model name: QJ71FL71(-T/-B5)(-F01)

Setting item	Current value	Setting value
Total Socket Section Transmission Count	0	
Total Socket Section Transmission Error Count	0	
Ethernet Transmission Error Count	0	
Total Receive Count	0	
Total Receive Error Count	0	
Ethernet Receive Error Count	0	
Token Transmission Count	0	
Cyclic Frame Transmission Count	0	
1:1 Message Frame Transmission Count	0	
1:N Message Frame Transmission Count	0	
Token Receive Count	0	

Flash ROM setting: Write to module / Save file / Current value display / Read from module / Load file / Make text file

Details   Monitoring   Cannot execute test

Start monitor   Stop monitor   Execute test   Close

Refer to Section 3.2.6(2)(e)

[Explanation of items]
(1) Items

Setting item   : Displays I/O signals and buffer memory names.

Current value   : Monitors the I/O signal states and present buffer memory values.

Setting value   : Input or selection of write data in test operations.

(2) Command buttons

| Current value display | Displays the current value of the item selected. (This is used to check the text that cannot be displayed in the current value field. However, in this utility package, all items can be displayed in the display fields). |

| Make text file | Creates a file containing the screen data in text file format. |

| Start monitor |/| Stop monitor | Selects whether or not to monitor current values. |

| Execute test | Performs a test on the selected items. To select more than one item, select them while holding down the | Ctrl | key. |

| Close | Closes the screen that is currently open and returns to the previous screen. |

```
  POINT
If test selection operations are performed on a setting that has been deleted (blank
setting value) using the  Delete  key, "Finished" will appear but writing is not
performed.
```

(3)   Steps for monitoring the buffer memory

```
            ╭─────────────╮
            │    Start    │
            ╰─────────────╯
                   │
                   ▼
            ┌─────────────┐
            │ Connect the │
            │ GX Developer│
            │ to the QCPU.│
            └─────────────┘
                   │
                   ▼
            ┌─────────────┐
            │  Start the  │
            │GX Configurator-FL│
            │monitor/test screen.│
            └─────────────┘
                   │
                   ▼
            ┌─────────────┐
            │Select the sub-screen│
            │of the buffer memory │
            │to be monitored and  │
            │press the sub-screen │
            │transition button.   │
            └─────────────┘
                   │
                   ▼
            ┌─────────────┐
            │The selected │
            │  sub-screen │
            │will be displayed.│
            └─────────────┘
                   │
                   ▼
            ┌─────────────┐
            │ Confirm the │
            │"current value" in│
            │the field of the │
            │item to monitored.│
            └─────────────┘
                   │
                   ▼
               ◇ Are there any
         NO   ◇ other buffer memory
              ◇ sub-screens to be
              ◇ monitored?
                   │ YES
                   ▼
            ╭─────────────╮
            │     End     │
            ╰─────────────╯
```

6.5 Programming

This section explains the programming for communicating using the FL-net module. When applying the following program examples to the actual system, make sure to examine the applicability and confirm that it will not cause system control problems.

(1)   If using GX Configurator-FL

```
        ( Steps for creating program )
                      │
                      ▼
        ┌──────────────────────────┐
        │      Initial settings     │ ······ Refer to Section 6.4.8
        └──────────────────────────┘
                      │
                      ▼
        ┌──────────────────────────┐
        │ Automatic refresh settings │ ······ Refer to Section 6.4.9
        └──────────────────────────┘
                      │
                      ▼
        ┌──────────────────────────┐
        │  Message transfer program  │ ······ Refer to Section 6.5.3
        └──────────────────────────┘           message transmission
                      │
                      ▼
             (    Operation    )
```

(2)   If not using GX Configurator-FL

```
        ( Steps for creating program )
                      │
                      ▼
        ┌──────────────────────────┐
        │  Initial processing program │ ······ Refer to Section 6.5.1
        └──────────────────────────┘           initial processing
                      │
                      ▼
        ┌──────────────────────────┐
        │ Cyclic transmission program │ ······ Refer to Section 6.5.2
        └──────────────────────────┘           cyclic transmission
                      │
                      ▼
        ┌──────────────────────────┐
        │ Message transmission program │ ······ Refer to Section 6.5.3
        └──────────────────────────┘           message transmission
                      │
                      ▼
             (    Operation    )
```

```
 ┌─────────────────────────────────────────────────────────────────────┐
 │  ┌──────────────┐                                                     │
 │  │  POINT       │                                                     │
 │  └──────────────┘                                                     │
 │  Also refer to Appendix 11 for programming when the FL-net module is  │
 │  mounted on the MELSECNET/H remote I/O station.                       │
 └─────────────────────────────────────────────────────────────────────┘
```

┌──────────────┐
│ REMARK   │
└──────────────┘

This item presents the environment for executing the program.
Local node number   : Node 03

I/O assignment (Q parameter setting screen)
        Classification   : Intelligent
        Model name   : QJ71FL71-T-F01
        Number of points   : 32 points
        First XY   : 0 (Occupies X/Y00 to X/Y01F)

Switch setting for I/O and intelligent function module
        Switch 1   : 192
        Switch 2   : 168
        Switch 3   : 250
        Switch 4   : 3
        Switch 5   : 0

Switch setting for I/O and intelligent function module

Input format   DEC. ▼

	Slot	Type	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0	PLC	PLC						
1	0(*-0)	Intelli.		192	168	250	3	0
2	1(*-1)							
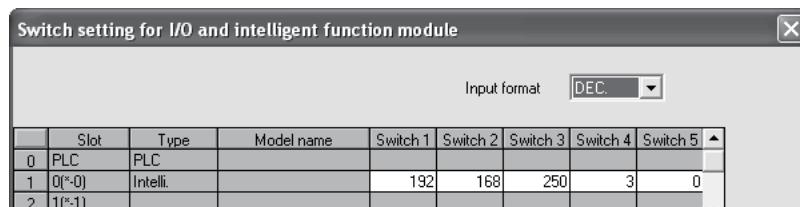
6.5.1 Initial processing

This section explains the initial processing of the FL-net module.
The local node network parameter area is set.

<<Initial processing>>


```
X1C
Module
ready
            [$MOV  "ABCD"  D0 ]        Node name : ABCD
                            Node name:
                            ABCD

            [BMOV  D0      U0\
                           G0      K5 ]    Node name
                   Node name: Node name        (equipment name) (Address: 0 to 4 (0H to 4H))
                   ABCD      (equipment name)

            [MOV   H20     U0\
                           G8 ]
                           Area 1
                           address: 20H        Area 1
                                               Start address (Address: 8(8H)) : 20H
                                               Size (Address: 9 (9H)) : 16 words
            [MOV   H10     U0\
                           G9 ]
                           Area 1 size:
                           16 words

            [MOV   H200    U0\
                           G10 ]
                           Area 2
                           address:
                           200H               Area 2
                                              Start address (Address: 10 (AH)) : 200H
                                              Size (Address: 11 (BH)) : 256 words
            [MOV   H100    U0\
                           G11 ]
                           Range 2 size:
                           256 words

            [MOV   K10     U0\
                           G12 ]            Token monitoring time out
                           Token             time (Address: 12 (CH)) : 10 ms
                           monitoring
                           time out time:
                           10 ms

            [MOV   K0      U0\
                           G13 ]            Minimum permissible
                           Minimum           frame interval (Address: 13 (DH)) : 0μs
                           permissible
                           frame
                           interval: 0μs

                           [SET   Y10 ]      Network parameter
                           Network parameter  write request
                           write request

X10    X18
                           [RST   Y10 ]      Network parameter
Network Parameter          Network parameter  setting normal
parameter setting          write request      completion processing
write    status
completion signal
signal                 Normal completion processing

       X18
                           [RST   Y10 ]      Network parameter
       Parameter           Network parameter  setting abnormal
       setting             write request      completion processing
       status
       signal          Abnormal completion processing

                           [END ]
```

```
POINT

The local node network parameter area can be set in Initial setting of GX
Configurator-FL.  (Refer to Section 6.4.8.)
The initial setting on GX Configurator-FL eliminates the need for creating the
sequence program shown here.
```

```
                                    Initialization              Write
                       Power on      completed          network parameters
                          |             |                       |
                          |             |                       |
Module ready X1C          |             |                       |
                   _____|_____|1)                     |
                                       \                        |
                                        _____
Local node network parameter setting    |                       |
buffer memory address : 0000H to         |   < Network parameter >     |
                                    _____|___<   setting   >_____|_____
                                         |              _____|
Network parameter write request Y10      |               2)\     |
                   _____|_____|  \   |_____
                                         |                 |   \  |      |
                                         |                 |    \ |      |
Network parameter write completion       |                 | 3) \ |      |
signal X10         _____|_____|____\_|_____|____
                                         |                 |      \       |
Parameter setting status signal X18      |                 |       _____|_____
                   _____|_____|_____|
                                         |                 |              |
                                         |                 |              |
Token enter status signal X19            |                 |              |
                   _____|_____|_____|____
```
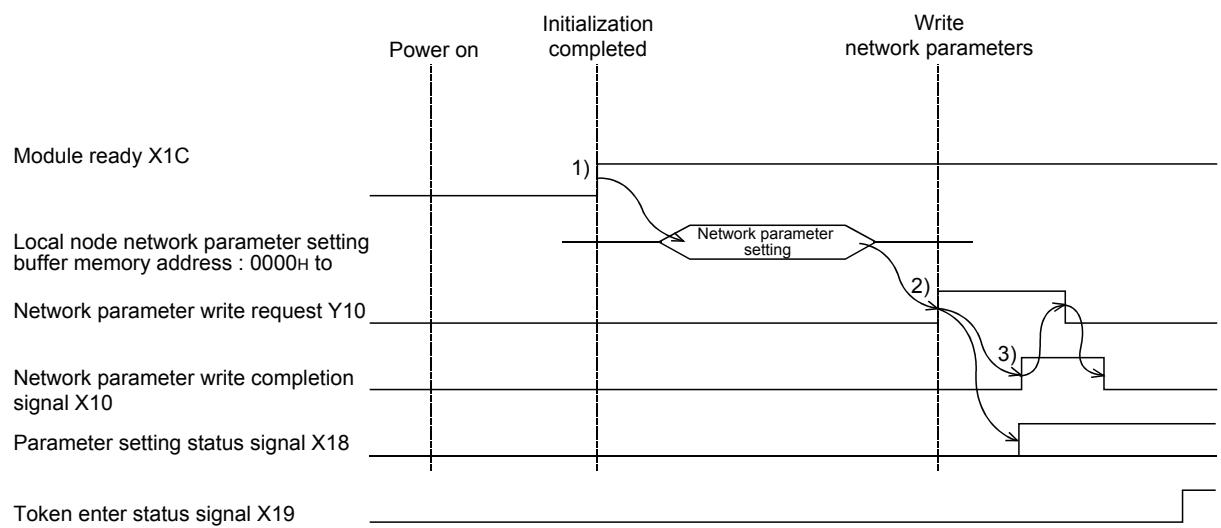
1) After turning the power on, confirm that the initializing of the FL-net module has completed normally.
    <Normal completion>
      • Module ready (X1C)   :ON
    <Abnormal completion>
      • Module ready (X1C)   :OFF
    If there is an abnormal completion, the settings for the FL-net module switches have to be reset.
    (Refer to Section 6.3.2.(2))

2) After setting the local node network parameter area data into the buffer memory (Address: 0000H to …), turn ON the network parameter write request (Y10).

3) Confirm network parameter write completion.
    <Normal completion>
      • Network parameter write completion signal (X10)   : ON
      • Parameter setting status signal (X18)   : OFF
      • Network parameter setting status   : 0
        (Buffer memory address: 9D2H)
        The FL-net module is participating in the token.
        (Token enter status signal (X19) : ON)
    <Abnormal completion>
      • Network parameter write completion signal (X10)   : ON
      • Parameter setting status signal (X18)   : ON
      • Network parameter setting status   : Other than 0
        (Buffer memory address : 9D2H)
    During error ending, after revising the network parameter by using the error code that is stored in the network parameter setting status, perform the initial processing once again. Refer to Section 8.5.2 for more information about the error codes.

    After confirming that the network parameter write completion signal (X10) is ON, the network parameter write request (Y10) is set to OFF.

POINT
Since the node name is set optionally, there will be no problems if the initial processing is performed without it.

6.5.2 Cyclic transmission

This section explains communication using the cyclic transmission of the FL-net module.

Cyclic transmission is performed at node 3, as shown below.
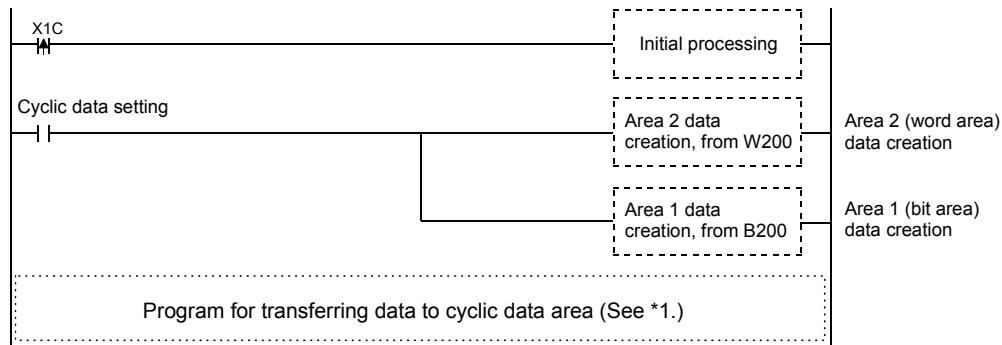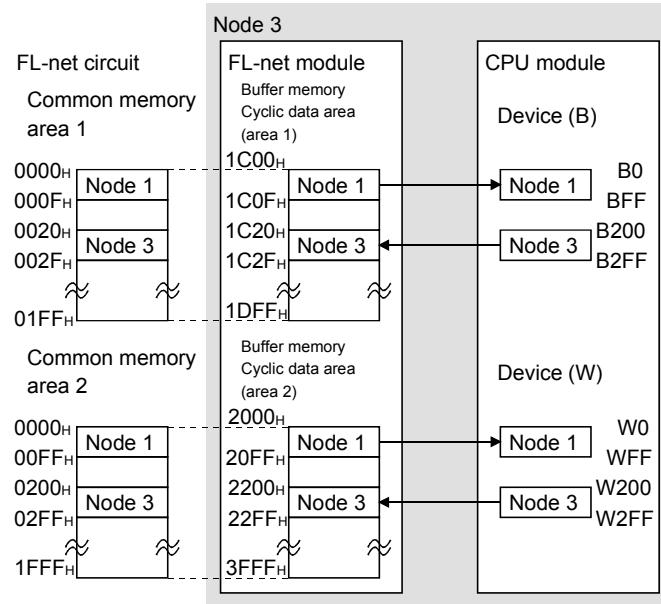
*1 If no auto refresh settings are configured (Refer to Section 6.4.9.), transfer the CPU module data to the cyclic data area of the FL-net module by the following sequence program.

Token enter

Token enter status signal X19 ___ 1)

Area 2 (word area) processing ___ 2) Processing

Area 1 (bit area) processing ___ 3) Processing
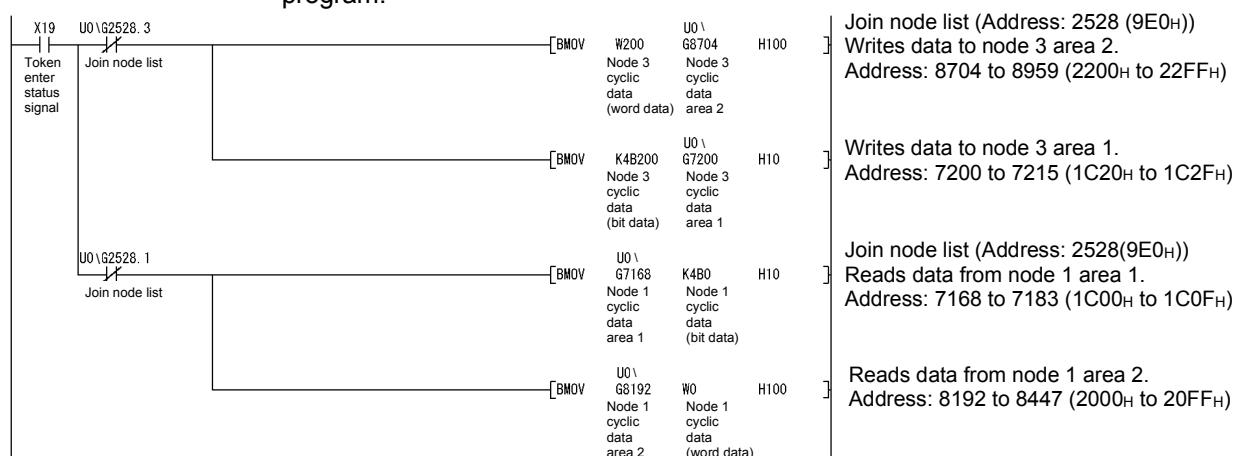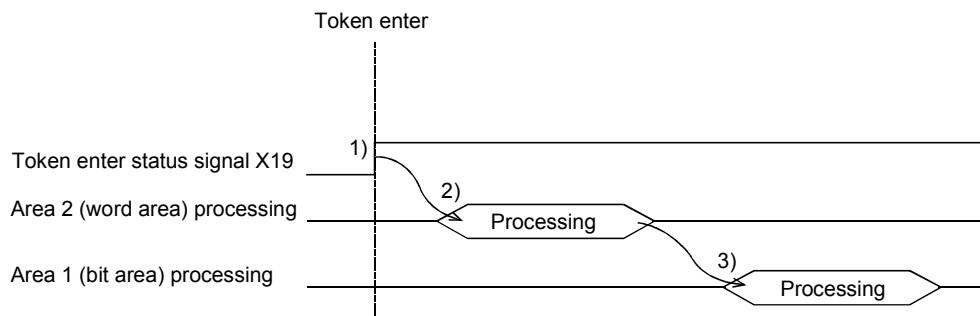
1) Confirms that the FL-net module token enter status signal (X19) is ON.

2) Data processing for area 2 (word area).

3) Data processing for area 1 (bit area).

```
┌─────────────┐
│  POINT      │
├─────────────┴──────────────────────────────────────────────────┐
│ (1)  Perform the data processing in the following sequence : area 2 (word area) →
│      area 1 (bit area).
│
│ (2)  Arrange so that node unit assurance for area 2 (word area) is handshake by bit
│      from area 1 (bit area).
│      For a handshake program example, refer to Section 6.2.7 (7) (c).
└──────────────────────────────────────────────────────────────────┘
```

6.5.3 Message transmission

This section explains communication using the FL-net module message transmission.

(1) Network parameter/join node information read
The following explains the network parameter/join node information read command.

```
┌─ POINT ──────────────────────────────────────────────────────────────────┐
│                                                                            │
│  The switching of Network parameter/join node information read is determined by │
│  buffer memory address 983H . . . b15. (Refer to Section 3.2.6.(2))        │
│    0 : Network parameter information read                                  │
│    1 : Join node information read                                          │
└────────────────────────────────────────────────────────────────────────────┘
```
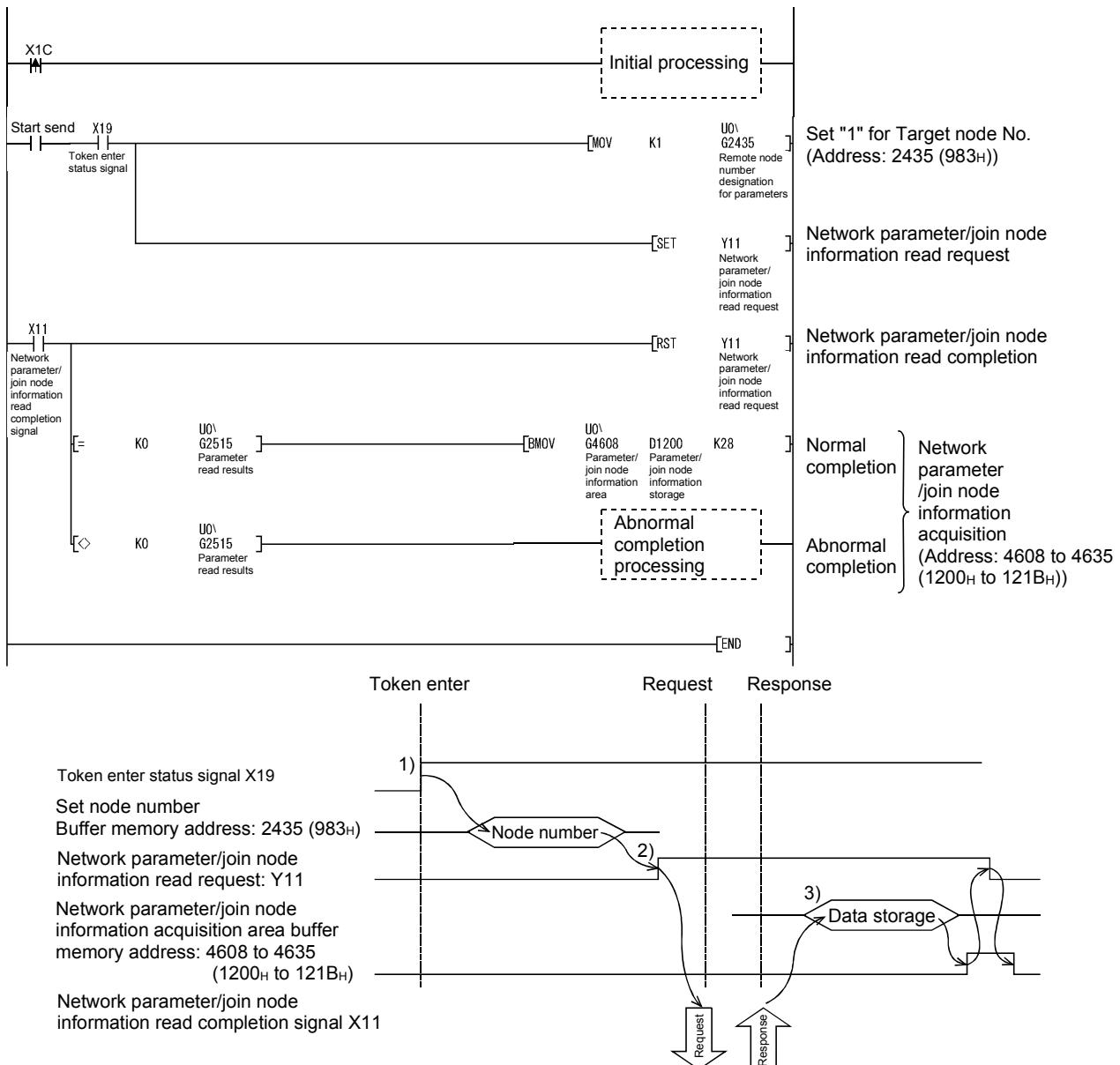
1) Confirms that the FL-net module token enter status signal (X19) is ON.

2) After setting the target node number to the buffer memory (address : 983$_H$), the network parameter/join node information read request (Y11) is set to ON.
   The FL-net module reads the network parameter for the target node.

3) The FL-net module stores the network parameter data for the target node in the buffer memory (address : 1200$_H$ to 121B$_H$).

4) Confirms network parameter read completion.
   <Normal completion>
     • Network parameter/join node information read completion signal (X11) : ON
     • Network parameter read results   : 0
       (Buffer memory address : 9D3$_H$)
   <Abnormal completion>
     • Network parameter/join node information read completion signal (X11) : ON
     • Network parameter read results   : Other than 0
       (Buffer memory address : 9D3$_H$)
   When there is an abnormal completion, after revising the network parameter/program using the error code that is stored in the network parameter read results, execute the network parameter read command once again. Refer to Section 8.5.2 for information about error codes.

   After confirming that the network parameter/join node information read completion signal (X11) is ON, the network parameter/join node information read request (Y11) is set to OFF.

(2) Device profile read

The following explains the device profile read command.

Signal	Description
X1C	Initial processing
Start send / X19 Token enter status signal	[MOV K1 U0\G2436 Remote node number designation for device profile] — Set "1" for Target node No. (Address: 2436 (984H))
	[SET Y13 Device profile read request] — Read device profile request
X13 Device profile read completion signal	[RST Y13 Device profile read request] — Read device profile completion
[= K0 U0\G2516 Device profile read results]	[BMOV U0\G5120 Device profile acquisition area D1400 Device profile storage K512] — Normal completion
[<> K0 U0\G2516 Device profile read results]	Abnormal completion processing — Abnormal completion
	[END]

Device profile data acquisition (Address: 5120 to 5631 (1400H to 15FFH))

Token enter status signal X19

Set node number
Buffer memory address: 2436
(984H)

Device profile read
request : Y13

Device profile acquisition area
buffer memory address: 5120 to
(1400H to)

Device profile read
completion X13

1)   Confirms that the FL-net module token enter status signal (X19) is ON.

2)   After setting the target node number to the buffer memory (address : 984$_H$), the device profile read request (Y13) is set to ON. The FL-net module reads the parameters for the target node.

3)   The FL-net module stores the device profile data for the target node in the buffer memory (address : 1400$_H$ to 15FF$_H$).

4)   Confirms device profile read completion.
     <Normal completion>
     • Device profile read completion signal (X13)   : ON
     • Device profile read results   : 0
       (Buffer memory address : 9D4$_H$)
     <Abnormal completion>
     • Device profile read completion signal (X13)   : ON
     • Device profile read results   : Other than 0
       (Buffer memory address : 9D4$_H$)
     When there is an abnormal completion, after revising the parameter/program using the error codes that are stored in the device profile read results, execute the device profile read command once again. Refer to Section 8.5.2 for information about error codes.

     After confirming that the device profile read completion signal (X13) is ON, the device profile read request (Y13) is set to OFF.

(3) Log information read

The following explains the log information read command.


```
      X1C
      ┤↑├────────────────────────────────────────────[ Initial processing ]

Send start  X19
      ┤├──┤├──────────────────────────────[MOV  K1   U0\G2438  ]  Set "1" for Target node No.
          Token enter                               Remote      (Address: 2438 (986H))
          status signal                             node number
                                                    designation
                                                    for log
                                                    information (2)

                                          ─────────[SET        Y15       ]  Log information read request
                                                               Log
                                                               information
                                                               read request

      X15
      ┤├──────────────────────────────────────────[RST        Y15       ]  Log information read completion
      Log                                                      Log
      information                                              information
      read                                                     read request
      completion
      signal
           ┤=  K0   U0\G2518 ├────────────[BMOV  U0\G5632  D1600  K192 ]  Normal        ⎫
                    Log information         Log         Log              completion     ⎪  Log information
                    read results            information  information                    ⎬  acquisition
                                            acquisition  storage                        ⎪  (Address: 5632 to 5823
                                            area                                        ⎪  (1600H to 16BFH))
           ┤◇  K0   U0\G2518 ├──────────[ Abnormal                    ]  Abnormal      ⎭
                    Log information         completion                    completion
                    read results            processing

      ───────────────────────────────────────────[END                 ]
```


Token enter status signal X19

Set node number
Buffer memory address: 2438
                      (986H)

Log information read request Y15

Log information acquisition area
buffer memory address: 5632 to
                      (1600H to)

Log information read completion
signal X15

Token enter   Request   Response

1)   Confirms that the FL-net module token enter status signal (X19) is ON.

2)   After setting the target node number to the buffer memory (address: 986_H), the log information read request (Y15) is set to ON. The FL-net module reads the parameters for the target node

3)   The FL-net module stores the log information for the target node in the buffer memory (address; 1600_H to $16BF_H$).

4)   Confirms log information read completion.
    <Normal completion>
      • Log information read completion signal (X15)   : ON
      • Log information read results   : 0
        (Buffer memory address : $9D6_H$)
    <Abnormal completion>
      • Log information read completion signal (X15)   : ON
      • Log information read results   : Other than 0
        (Buffer memory address : $9D6_H$)
    When there is an abnormal completion, after revising the parameter/program using the error codes that are stored in the log information read results, execute the log information read command once again. Refer to Section 8.5.2 for information about error codes.

    After confirming that the log information read completion signal (X15) is ON, the log information read request (Y15) is set to OFF.

(4) Log information clear
The following explains the log information clear command.

X1C ──┤↑├── Initial processing

Send start X19 ──┤├──┤├── [MOV K1 U0\G2437 Remote node number designation for log information (1)] Set "1" for Target node No. (Address: 2437 (985H))

[SET Y14 Log information clear request] Log information clear request

X14 ──┤├── [RST Y14 Log information clear request] Log information clear completion

[<> K0 U0\G2517 Log information clear results] Error completion processing Log information clear error completion (Address: 2517 (9D5H))

[END]

Token enter   Request Response

Token enter status signal X19   1)
Set node number
Buffer memory address: 2437 (985H)   Node number   2)
Log information clear request Y14
                                                     3)
Log information clear completion
signal X14

Request   Response

1)   Confirms that the FL-net module token enter status signal (X19) is ON.

2)   After setting the target node number to the buffer memory (address: 985$_H$), the log information clear request (Y14) is set to ON. The FL-net module performs log information clear for the target node.

3)   Confirms log information clear completion.
     <Normal completion>
        • Log information clear completion signal   : ON
          (X14)
        • Log information clear results   : 0
          (Buffer memory address : 9D5$_H$)
     <Abnormal completion>
        • Log information clear completion signal   : ON
          (X14)
        • Log information clear results   : Other than 0
          (Buffer memory address : 9D5$_H$)

     When there is an abnormal completion, after revising the parameter/program using the error codes that are stored in the log information clear results, execute the log data clear command once again. Refer to Section 8.5.2 for information about error codes.

     After confirming that the log information clear completion signal (X14) is ON, the log information clear request (Y14) is set to OFF.

(5) Transparent type message
The following explains the send/receive commands for the transparent type message.

[Send]

Sequence program	Main module
Send message write	
	Send message area
Message transmission request ON	
Y0	
	Message transmission normal/abnormal completion signal ON
X0/X1	
Message transmission request OFF	
Y0	

[Receive]

Main module	Sequence program
Receive message area	
	X2 Receiving massage signal ON
	Receive message read
	Y2 Message receive completion confirmation ON
	X2 Receiving massage signal OFF
	Y2 Message receive completion confirmation OFF

(a) Message send

The following explains the message transmission command.

```
 X1C
──┤├──────────────────────────────────────────┤ Initial processing ├      Initial processing
Module ready


Send start  X19
──┤├────┤├───────────────────────────────────┤ Message data      ├       Message data
         Token                                   creation         │        creation
         enter status
         signal

                                                          U0\
                                       ┤MOV    K1    G24576 ]              Set "1" for Target node No.
                                                   Remote node             (Address: 24576 (6000H))
                                                   number
                                                   setting for
                                                   message send
                                                   signal

                                                          U0\
                                       ┤MOV    K10   G24577 ]              Transaction code
                                                   Transaction             (Address: 24577 (6001H))
                                                   code setting

                                                          U0\
                                       ┤MOV    H100  G24578 ]              Send data size
                                                   Send data               (Address: 24578 (6002H))
                                                   size setting

                                                   U0\
                                    ┤BMOV  D6000  G24579  H100 ]           Send data
                                          Message  Send data               (Address: 24579 to (6003H to))
                                          send     area
                                          data

                                                          U0\
                                       ┤MOV    K0    G2464  ]              Response message
                                                   Response                classification
                                                   message                 (Address: 2464 (9A0H))
                                                   classification
                                                   setting

                                                          U0\
                                    ┤DMOV   H0A8000000  G2466 ]            Virtual address space
                                                   Virtual address         address *1
                                                   space address           (Address: 2466 to 2467 (9A2H to 9A3H))
                                                   setting

                                                          U0\
                                       ┤MOV    H100  G2465  ]              Virtual address space size *1
                                                   Virtual address         (Address: 2465 (9A1H))
                                                   space size
                                                   setting

                                              ┤SET    Y0 ]                 Message transmission request
                                                   Message
                                                   transmission
                                                   request

 X0
──┤├──────────────────────────────────────────┤RST    Y0 ]                Message transmission completion
Message                                            Message
Transmission                                       transmission
normal                                             request
completion
signal

 X1     X0
──┤├────┤├─────────────────────────────────────┤ Normal completion ├      Normal
Message  Message                                    processing      │       completion
Transmission Transmission                                           │
abnormal  normal                                                    ├ Message send
completion completion                                               │
signal   signal                                                     │
        X1                                                          │
       ──┤├────────────────────────────────────┤ Abnormal          ├      Abnormal
         Message                                   completion       │       completion
         Transmission                              processing       │
         abnormal
         completion
         signal

                                              ┤END ]
```

*1 When the target node is a Q series FL-net module, specify 0H.

Token enter status signal X19

Message send area setting
Buffer memory address 6000H to 6102H

Message transmission request Y00

Message transmission normal
completion signal X00

Message transmission abnormal
completion signal X01

1) Confirms that the FL-net module token enter status signal (X19) is ON.

2) After setting the data shown below to the buffer memory (address : 6000$_H$ to 6102$_H$, 9A0$_H$ to 9A3$_H$), message transmission request (Y00) is set to ON.
    • Target node number
    • Transaction code
    • Send data size
    • Send data
    • Response message classification
    • Virtual address space address
    • Virtual address space size

3) Confirm the transmission complete of the message.
    <Normal completion>
      • Message transmission normal completion   : ON
        signal (X00)
      • Message transmission abnormal completion   : OFF
        signal (X01)
      • Transparent message send result   : 0
        (Buffer memory address : 9D7$_H$)
    <Abnormal completion>
      • Message transmission normal completion   : OFF
        signal (X00)
      • Message transmission abnormal completion   : ON
        signal (X01)
      • Transparent message send results   : Other than 0
        (Buffer memory address : 9D7$_H$)

    If the transmission has completed abnormally, correct the parameters or program according to the error code stored in the transparent type message transmission result area, and execute the transparent type message transmission. Refer to Section 8.5.2 for information about error codes.

    After confirming that the message transmission normal completion signal (X00)/message transmission abnormal completion signal (X01) is ON, the message transmission request (Y00) is set to OFF.

(b)   Message receive
The following explains the message receive command.

```
      X1C                                                    ┌──────────────┐
      ─┤↑├───────────────────────────────────────────────── │ Initial      │
                                                             │ processing   │
                                                             └──────────────┘

      X2                                        U0\
      ─┤ ├──────────────────────────────[MOV   G25602   Z1 ]     Receive data size read
   Receiving                                                     (Address: 25602 (6402H))
   message
   signal

                                              U0\
              ────────────────────────[BMOV   G25603   D6400  Z1 ]   Receive data read
                                                       Receive          (Address: 25603 to (6403H to))
                                                       data area

              ─────────────────────────────────[SET   Y2 ]     Message receive completion
                                                    Massage         confirmation
                                                    receive
                                                    completion
                                                    confirmation

      X2      Y2
      ─┤/├────┤ ├──────────────────────────────[RST   Y2 ]     Message receive processing
   Receiving Massage                                Massage        completion
   message  receive                                 receive
   signal   completion                              completion
            confirmation                            confirmation

              ──────────────────────────────────────[END ]
```

1) Once the data receive completion is in the FL-net module buffer memory message data receive area (address: 6400$_H$ to), the receiving message signal (X02) is set to ON.

2) After the message data has been transferred to the device (read), the message receive completion confirmation (Y02) is set to ON.

3) After confirming that the receiving message signal (X02) is OFF, the message receive completion confirmation (Y02) is set to OFF.

POINT

When a response is needed for message data receive, create a sequence program for the response.

(6) Other messages (Transparent type messages)

For messages other than (1) to (5), the transparent type message transmission realizes the client function.

To realize the client function of each message, a request message transmission program and a response message reception program are required.

For program examples, refer to (5).

This section provides the items for which the settings are required for each request message transmission and those for which values are stored at the time of response message reception.

> **POINT**
>
> Completion of each message processing must be recognized by completion of request message transmission and response message reception.

(a) Byte block read

1) Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
9A0H	Response message classification	Not needed (0)
9A1H	Visual address space data size	Read data size (1 to 1024 bytes)
9A2H to 9A3H	Visual address space first address	Visual address space first address
6000H	Target node number	1 to 254
6001H	Transaction code	65003
6002H	Send data size (byte/word length)	Not needed (0)
6003H to 6202H	Send data area (512 words)	Not needed (0)

2) Items for which values are stored at response message reception

Buffer memory address	Name	Stored value (Decimal)
C00H	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
C01H	Visual address space data size	Value same as in request message
C02H to C03H	Visual address space first address	Value same as in request message
6400H	Send source node number	Value same as in request message
6401H	Transaction code	65203
6402H	Receive data size (byte/word length)	Read data size (1 to 1024 bytes/512 words)
6403H to 6602H	Receive data area (512 words)	Read data

(b) Byte block write

1) Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
9A0H	Response message classification	Not needed (0)
9A1H	Visual address space data size	Write data size (1 to 1024 bytes)
9A2H to 9A3H	Visual address space first address	Visual address space first address
6000H	Target node number	1 to 254
6001H	Transaction code	65004
6002H	Send data size (byte/word length)	Write data size (1 to 1024 bytes/512 words)
6003H to 6202H	Send data area (512 words)	Write data

2) Items for which values are stored at response message reception

Buffer memory address	Name	Stored value (Decimal)
C00H	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
C01H	Visual address space data size	Value same as in request message
C02H to C03H	Visual address space first address	Value same as in request message
6400H	Send source node number	Value same as in request message
6401H	Transaction code	65204
6402H	Receive data size (byte/word length)	0
6403H to 6602H	Receive data area (512 words)	0

(c) Word block read

1) Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
9A0H	Response message classification	Not needed (0)
9A1H	Visual address space data size	Read data size (1 to 512 words)
9A2H to 9A3H	Visual address space first address	Visual address space first address
6000H	Target node number	1 to 254
6001H	Transaction code	65005
6002H	Send data size (byte/word length)	Not needed (0)
6003H to 6202H	Send data area (512 words)	Not needed (0)

2)   Items for which values are stored at response message reception

Buffer memory address	Name	Stored value (Decimal)
C00H	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
C01H	Visual address space data size	Value same as in request message
C02H to C03H	Visual address space first address	Value same as in request message
6400H	Send source node number	Value same as in request message
6401H	Transaction code	65205
6402H	Receive data size (byte/word length)	Read data size (1 to 1024 bytes/512 words)
6403H to 6602H	Receive data area (512 words)	Read data

(d)   Word block write

1)   Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
9A0H	Response message classification	Not needed (0)
9A1H	Visual address space data size	Write data size (1 to 512 words)
9A2H to 9A3H	Visual address space first address	Visual address space first address
6000H	Target node number	1 to 254
6001H	Transaction code	65006
6002H	Send data size (byte/word length)	Write data size (1 to 1024 bytes/512 words)
6003H to 6202H	Send data area (512 words)	Write data

2)   Items for which values are stored at response message reception

Buffer memory address	Name	Stored value (Decimal)
C00H	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
C01H	Visual address space data size	Value same as in request message
C02H to C03H	Visual address space first address	Value same as in request message
6400H	Send source node number	Value same as in request message
6401H	Transaction code	65206
6402H	Receive data size (byte/word length)	0
6403H to 6602H	Receive data area (512 words)	0

(e)   Network parameter write
1)   Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
9A0H	Response message classification	Not needed (0)
9A1H	Visual address space data size	Not needed (0)
9A2H to 9A3H	Visual address space first address	Not needed (0)
6000H	Target node number	1 to 254
6001H	Transaction code	65008
6002H	Send data size (byte/word length)	20 bytes/10 words
6003H	Setting parameter flag	1: Set address and size only 2: Set node name only 3: Set address, size and node name
6004H	Area 1 first address	0 to 511
6005H	Area 1 size	0 to 512
6006H	Area 2 first address	0 to 8191
6007H	Area 2 size	0 to 8192
6008H to 600CH	Node name	Character string (10 bytes or less)

2)   Items for which values are stored at response message reception

Buffer memory address	Name	Stored value (Decimal)
C00H	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
C01H	Visual address space data size	0
C02H to C03H	Visual address space first address	0
6400H	Send source node number	Value same as in request message
6401H	Transaction code	65208
6402H	Receive data size (byte/word length)	0
6403H to 6602H	Receive data area (512 words)	0

(f)   Operate command
1)   Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
9A0H	Response message classification	Not needed (0)
9A1H	Visual address space data size	Not needed (0)
9A2H to 9A3H	Visual address space first address	Not needed (0)
6000H	Target node number	1 to 254
6001H	Transaction code	65010
6002H	Send data size (byte/word length)	Not needed (0)
6003H to 6202H	Send data area (512 words)	Not needed (0)

2) Items for which values are stored at response message reception

Buffer memory address	Name	Stored value (Decimal)
C00H	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
C01H	Visual address space data size	0
C02H to C03H	Visual address space first address	0
6400H	Send source node number	Value same as in request message
6401H	Transaction code	65210
6402H	Receive data size (byte/word length)	0
6403H to 6602H	Receive data area (512 words)	0

(g) Stop command

1) Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
9A0H	Response message classification	Not needed (0)
9A1H	Visual address space data size	Not needed (0)
9A2H to 9A3H	Visual address space first address	Not needed (0)
6000H	Target node number	1 to 254
6001H	Transaction code	65009
6002H	Send data size (byte/word length)	Not needed (0)
6003H to 6202H	Send data area (512 words)	Not needed (0)

2) Items for which values are stored at response message reception

Buffer memory address	Name	Stored value (Decimal)
C00H	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
C01H	Visual address space data size	0
C02H to C03H	Visual address space first address	0
6400H	Send source node number	Value same as in request message
6401H	Transaction code	65209
6402H	Receive data size (byte/word length)	0
6403H to 6602H	Receive data area (512 words)	0

(h)   Message return

1)   Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
9A0H	Response message classification	Not needed (0)
9A1H	Visual address space data size	Not needed (0)
9A2H to 9A3H	Visual address space first address	Not needed (0)
6000H	Target node number	1 to 254
6001H	Transaction code	65015
6002H	Send data size (byte/word length)	Return data size (1 to 1024 bytes/512 words)
6003H to 6202H	Send data area (512 words)	Return data

2)   Items for which values are stored at response message reception

Buffer memory address	Name	Stored value (Decimal)
C00H	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
C01H	Visual address space data size	0
C02H to C03H	Visual address space first address	0
6400H	Send source node number	Value same as in request message
6401H	Transaction code	65215
6402H	Receive data size (byte/word length)	Value same as in request message
6403H to 6602H	Receive data area (512 words)	Value same as in request message

6.5.4 Sample program

The following sample programs are provided relating to cyclic transmission and transparent type message transmission.
• Programs using GX Configurator-FL
• Programs not using GX Configurator-FL.

(1) Execution environment of program examples

(a) Node 1 side

1) FL-net module mounting station CPU   : Q25HCPU

2) FL-net module input/output number   : X/Y000 to X/Y01F

3) FL-net module IP address   : 192.168.250.1
   (Set these in GX Developer's intelligent function module switch setting. (Refer to Section 6.3.2.))

(b) Node 3 side

1) FL-net module mounting station CPU   : Q06HCPU

2) FL-net module input/output number   : X/Y000 to X/Y01F

3) FL-net module IP address   : 192.168.250.3
   (Set these in GX Developer's intelligent function module switch setting. (Refer to Section 6.3.2.))

(2) Summary of program

(a) Cyclic transmission
    Cyclic transmission program for node 1 $\leftarrow$ $\rightarrow$ node 3.
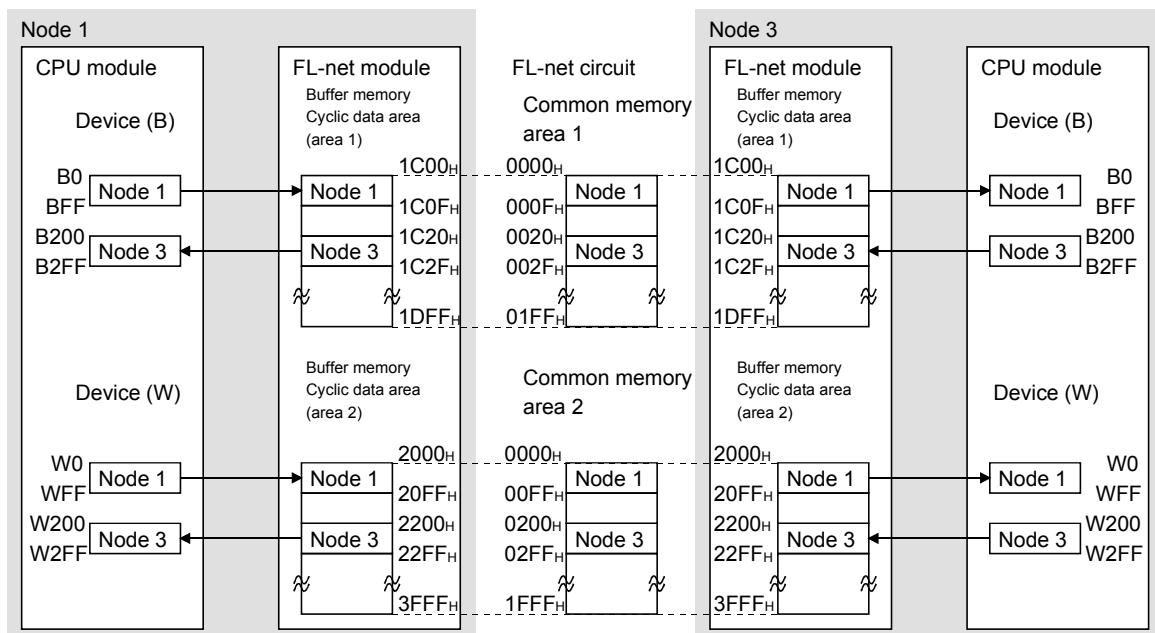
(b)   Transparent type message transmission
      Transparent type message transmission node 1 ← node 3.
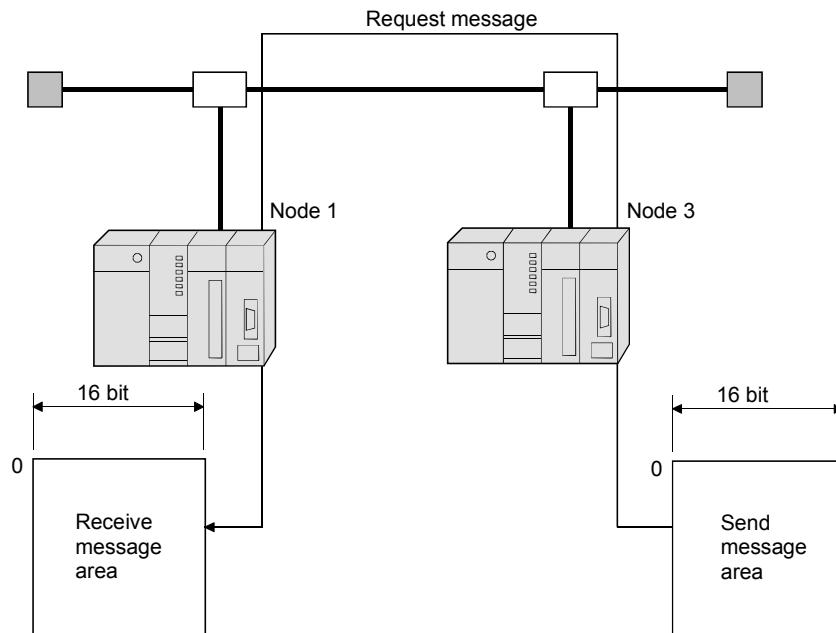
REMARK

The cyclic data area assignment sheet is provided in this manual. (Refer to Appendix 11.)
Please utilize the sheet for check of the cyclic data area assignment.
The following is an example for how to fill out the form in the case of this sample program.

(1) Area 1 (bit area)

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 01FF$_H$)	Buffer memory address (1C00 to 1DFF$_H$)	Data size (Word units)	Buffer offset	PLC side device	
1	0000 to 000F$_H$	1C00 to 1C0F$_H$	16	0	B0 to BFF	
3	0020 to 002F$_H$	1C20 to 1C2F$_H$	16	32	B200 to B2FF	Local node

(2) Area 2 (word area)

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 1FFF$_H$)	Buffer memory address (2000 to 3FFF$_H$)	Data size (Word units)	Buffer offset	PLC side device	
1	0000 to 00FF$_H$	2000 to 20FF$_H$	256	0	W0 to WFF	
3	0200 to 02FF$_H$	2200 to 22FF$_H$	256	512	W200 to W2FF	Local node

(3) Example of program that used GX Configurator-FL

    (a) Node 1

      1) GX Configurator-FL operation

        • Initial settings (Refer to Section 6.4.8)
         Set as follows: node name to node 1, area 1 first address to 0000$_H$, area 1 size to 10$_H$, area 2 first address to 0000$_H$, area 2 size to 100$_H$.
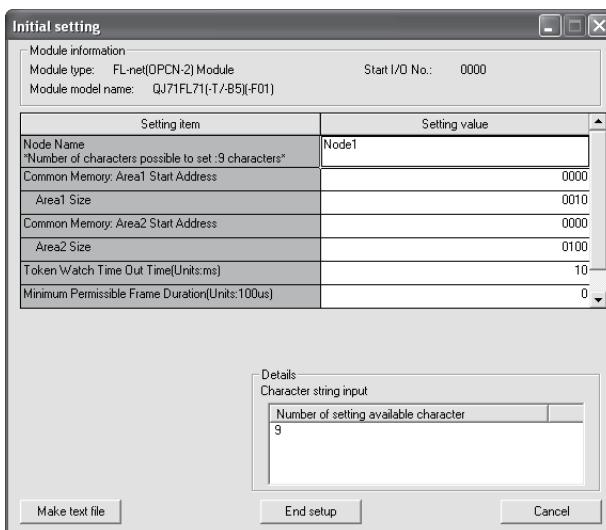
        • Auto refresh setting (Refer to Section 6.4.9)

Setting item		Module side Transfer word count	Module side Buffer offset	PLC side Device
Cyclic Data: Area 1	Local Node Area	16	0	B0
	Other Node Area	16	32	B200
Cyclic Data: Area 2	Local Node Area	256	0	W0
	Other Node Area	256	512	W200
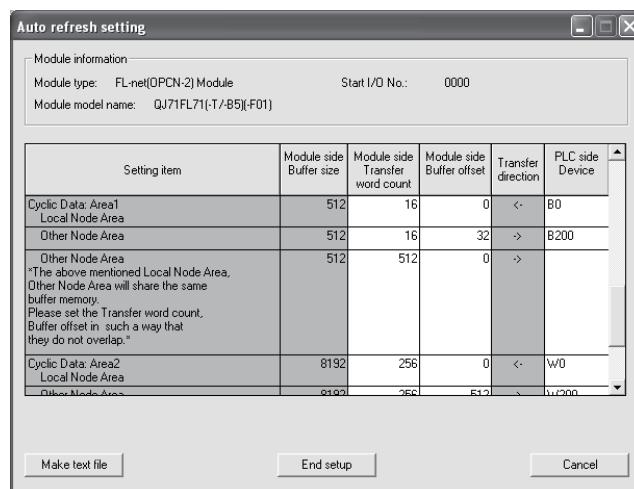
        • Writing of intelligent function module parameters (Refer to Section 6.4.7)
         The intelligent function module parameters are written to the CPU module. Operations are executed on the parameter setting module selection screen.

2)   Program example

<<Cyclic transmission>>

<<Message transmission transparent type message reception>>
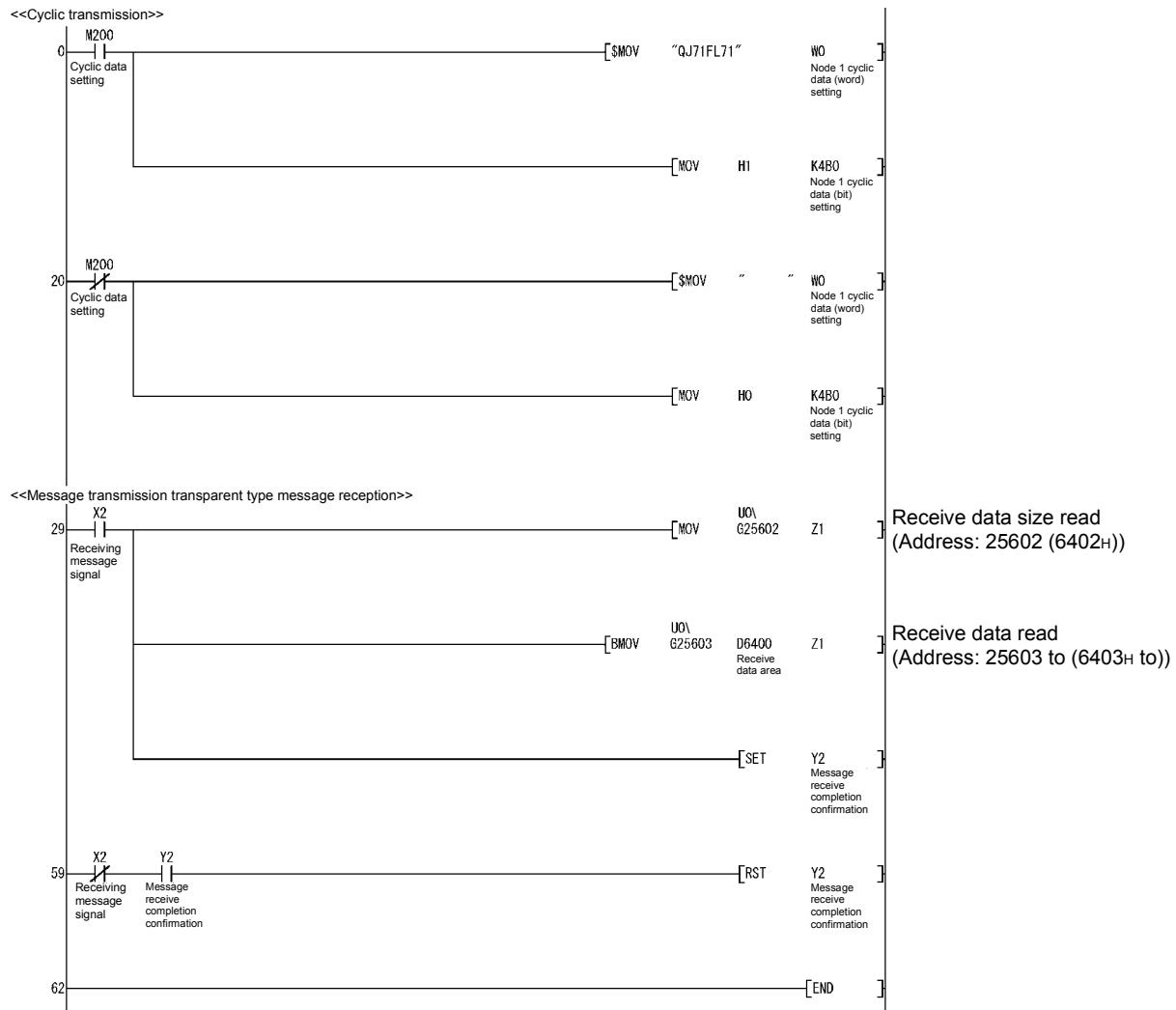
(b)   Node 3

1)   GX Configurator-FL operations

• Initial settings (Refer to Section 6.4.8)
Set as follows: node name to node 3, area 1 first address to 0020H, area 1 size to 10H, area 2 first address to 0200H, area 2 size to 100H.
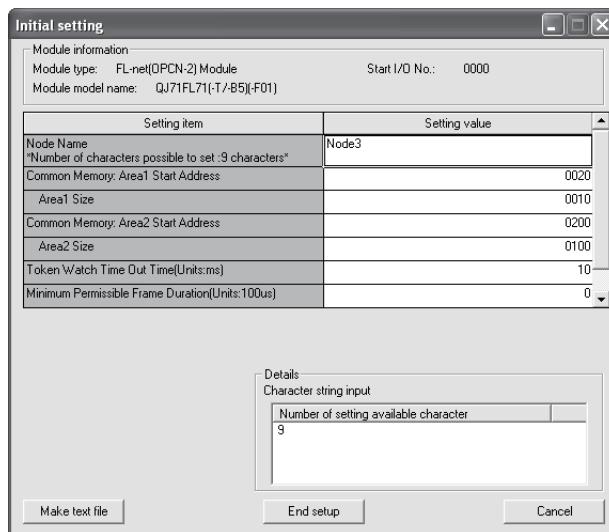
• Auto refresh setting (Refer to Section 6.4.9)

Setting item		Module side Transfer word count	Module side Buffer offset	PLC side Device
Cyclic Data: Area 1	Local Node Area	16	32	B200
	Other Node Area	16	0	B0
Cyclic Data: Area 2	Local Node Area	256	512	W200
	Other Node Area	256	0	W0

• Writing of intelligent function module parameters (Refer to Section 6.4.7)
The intelligent function module parameters are written to the CPU module. Operations are executed on the parameter setting module selection screen.

2) Program example

<<Cyclic transmission>>

```
      M200
   0 ─┤├──────────────────────────────────────[$MOV  "MELSEC"  W200    ]
   Cyclic data                                           Node 3
   setting                                               cyclic
                                                         data (word)
                                                         setting

                                                 ──────[MOV    H1       K4B200  ]
                                                                        Node 3
                                                                        cyclic
                                                                        data (bit)
                                                                        setting

      M200
  19 ─┤/├──────────────────────────────────────[$MOV  "      "  W200    ]
   Cyclic data                                           Node 3
   setting                                               cyclic
                                                         data (word)
                                                         setting

                                                 ──────[MOV    H0       K4B200  ]
                                                                        Node 3
                                                                        cyclic
                                                                        data (bit)
                                                                        setting
```

<<Message transmission transparent type message send>>

```
      M600    X19
  28 ─┤├─────┤├──────────────────────────────[$MOV  "SAMPLE_PROGRAM"  D6000   ]
   Mess_Sen  Token                                                    Message
   d         enter                                                    send data
             status
             signal

                                             ──────[MOV    K1       U0\       ]     Another node No. setting for
                                                                    G24576          message transmission
                                                                    Target          (Address: 24576 (6000H))
                                                                    node

                                             ──────[MOV    K10      U0\       ]     Transaction code setting
                                                                    G24577          (Address: 24577 (6001H))
                                                                    Transaction
                                                                    code setting

                                             ──────[MOV    H100     U0\       ]     Send data size setting
                                                                    G24578          (Address: 24578 (6002H))
                                                                    Send data
                                                                    size setting

                                           ──[BMOV  D6000    U0\       H100   ]     Send data area (Address: From
                                                    Message  G24579                 24579 (6003H))
                                                    send data Send
                                                             data area

                                             ───────────────────────[SET  Y0    ]
                                                                          Message
                                                                          Transmission
                                                                          request

      X0
  77 ─┤├─────────────────────────────────────────────────[RST  Y0    ]
   Message                                                      Message
   Transmission                                                 Transmission
   normal                                                       request
   completion
   signal

      X1      X0
     ─┤├─────┤├───────────────────────────────────────────[RST  M600  ]
   Message  Message                                             Mess_Sen
   Transmission Transmission                                    d
   abnormal normal
   completion completion
   signal    signal

      X1
     ─┤├───────────────────────────[BMOV  U0\      D600     K10  ]     Transparent type message send
   Message                                G2519    Transparent             results (Address 2519 (9D7H))
   Transmission                           Transparent type
   abnormal                               type     message
   completion                             message  send results
   signal                                 send results storing

  90 ──────────────────────────────────────────────────────[END  ]
```

(4) Example of program not using GX Configurator-FL

(a) Node 1 side

<<Initial processing>>

```
  X1C
──┤├────────────────────────────────────────[$MOV  "1"        D0        ]
 Module                                                        Node name:
 ready                                                         Node 1

  │                                                  U0\
  │                                                  G0
  ├───────────────────────────────────[BMOV  D0     Node name  K5        ]
  │                                          Node    (Equipment name)
  │                                          name:
  │                                          Node 1

  │                                                  U0\
  │                                                  G8
  ├──────────────────────────────────────────[MOV  H0         ]
  │                                                  Area 1
  │                                                  address: 0H

  │                                                  U0\
  │                                                  G9
  ├──────────────────────────────────────────[MOV  H10        ]
  │                                                  Area 1 size:
  │                                                  16 words

  │                                                  U0\
  │                                                  G10
  ├──────────────────────────────────────────[MOV  H0         ]
  │                                                  Area 2
  │                                                  address: 0H

  │                                                  U0\
  │                                                  G11
  ├──────────────────────────────────────────[MOV  H100       ]
  │                                                  Area 2 size:
  │                                                  256 words

  │                                                  U0\
  │                                                  G12
  ├──────────────────────────────────────────[MOV  K10        ]
  │                                                  Token
  │                                                  monitoring
  │                                                  time out
  │                                                  time: 10 ms

  │                                                  U0\
  │                                                  G13
  ├──────────────────────────────────────────[MOV  K0         ]
  │                                                  Minimum
  │                                                  permissible
  │                                                  frame
  │                                                  interval: 0 μs

  │                                                  ─[SET  Y10  ]
  │                                                         Network
  │                                                         parameter
  │                                                         write request

  X10     X18
──┤├─────┤╱├──────────────────────────────────────────[RST  Y10  ]
 Network  Parameter                                          Network
 parameter setting                                           parameter
 write    status signal                                      write request
 completion
 signal
          X18
        ──┤├────────────────────────────────────────────[RST  Y10  ]
          Parameter                                            Network
          setting                                              parameter
          status signal                                        write request
```

Node name (Equipment name)
(Address: 0 to 4 (0H to 4H))

Area 1 start address
(Address: 8 (8H)): 0H

Area 1 size (Address: 9 (9H))
: 16 words

Area 2 start address
(Address: 10 (AH)): 0H

Area 2 size (Address: 11 (BH))
: 256 words

Token monitoring time out time
(Address: 12 (CH)): 10ms

Minimum permissible frame interval
(Address: 13 (DH)): 0μs

<<Cyclic transmission>>

```
        M200
51      ─┤├─                                    ─[$MOV    "QJ71FL71"      W0        ]
        Cyclic                                                           Node 1
        data                                                             cyclic
        setting                                                          data (word)
                                                                         setting

                                               ─[MOV      H1              K4B0      ]
                                                                         Node 1
                                                                         cyclic
                                                                         data (bit)
                                                                         setting

        M200
71      ─┤/├─                                   ─[$MOV     "      "       W0        ]
        Cyclic                                                           Node 1
        data                                                             cyclic
        setting                                                          data (word)
                                                                         setting

                                               ─[MOV      H0              K4B0      ]
                                                                         Node 1
                                                                         cyclic
                                                                         data (bit)
                                                                         setting

        X19      U0\G2528.1
80      ─┤├──────┤/├──────────────────┬─────────[BMOV     W0         U0\G8192   H100 ]
        Token    Join node list       │                  Node 1     Node 1
        enter                         │                  cyclic     cyclic
        status                        │                  data       data
        signal                        │                  (word data) area 2
                                      │
                                      └─────────[BMOV     K4B0       U0\G7168   H10  ]
                                                          Node 1     Node 1
                                                          cyclic     cyclic
                                                          data       data
                                                          (bit data) area 1

                 U0\G2528.3
         ────────┤/├──────────────────┬─────────[BMOV     U0\G7200   K4B200     H10  ]
                 Join node list       │                  Node 3     Node 3
                                      │                  cyclic     cyclic
                                      │                  data       data
                                      │                  area 1     (bit data)
                                      │
                                      └─────────[BMOV     U0\G8704   W200       H100 ]
                                                          Node 3     Node 3
                                                          cyclic     cyclic
                                                          data       data
                                                          area 2     (word data)
```

Join node list
(Address: 2528 (9E0$_H$))
Node 1 cyclic data area 2
(Address: From 8192 (2000$_H$))

Node 1 cyclic data area 1
(Address: From 7168 (1C00$_H$))

Join node list
(Address: 2528 (9E0$_H$))
Node 3 cyclic data (bit data) (Address: From 7200 (1C20$_H$))

Node 3 cyclic data (word data) (Address: From 8704 (2200$_H$))

<<Message transmission, transparent type message reception>>

```
        X2
109     ─┤├─                                    ─[MOV      U0\G25602       Z1        ]
        Receiving
        messsage
        signal

                                               ─[BMOV     U0\G25603   D6400      Z1  ]
                                                                      Receive
                                                                      data area

                                               ─[SET                 Y2        ]
                                                                      Message
                                                                      receive
                                                                      completion
                                                                      confirmation

        X2       Y2
139     ─┤/├─────┤├─                            ─[RST                 Y2        ]
        Receiving Message                                             Message
        message   recieve                                             receive
        signal    completion                                          completion
                  confirmation                                        confirmation

142     ──────────────────────────────────────────────────────────[END        ]
```

Receive data size read
(Address: 25602 (6402$_H$))

Receive data read
(Address: From 25603 (6403$_H$))

(b) Node 3

<<Initial processing>>

```
       X1C
0     ─┤├─────────────────────────────────[$MOV  "Node 3"   D0        ]
      Module                                                Node name:
      ready                                                 Node 3

                                          ─[BMOV  D0         U0\        K5 ]
                                                 Node       G0
                                                 name:      Node name
                                                 Node 3     (Equipment name)
```
Node name (Eequipment name)
(Address: 0 to 4 (0_H to 4_H))

```
                                          ─[MOV   H20        U0\        ]
                                                            G8
                                                            Area 1
                                                            address:20H
```
Area 1 start address
(Address: 8 (8_H)): 20_H

```
                                          ─[MOV   H10        U0\        ]
                                                            G9
                                                            Area 1 size:
                                                            16 words
```
Area 1 size (Address: 9 (9_H))
: 16 words

```
                                          ─[MOV   H200       U0\        ]
                                                            G10
                                                            Area 2
                                                            address:200H
```
Area 2 start address
(Address: 10 (A_H)): 200_H

```
                                          ─[MOV   H100       U0\        ]
                                                            G11
                                                            Area 2 size:
                                                            256 words
```
Area 2 size (Address: 11 (B_H))
: 256 words

```
                                          ─[MOV   K10        U0\        ]
                                                            G12
                                                            Token
                                                            monitoring
                                                            time out
                                                            time: 10 ms
```
Token monitoring time out time
(Address: 12 (C_H)): 10ms

```
                                          ─[MOV   K0         U0\        ]
                                                            G13
                                                            Minimum
                                                            permissible
                                                            frame
                                                            interval: 0 μs
```
Minimum permissible frame interval
(Address: 13 (D_H)): 0μs

```
                                          ─[SET   Y10        ]
                                                 Network
                                                 parameter
                                                 write request

       X10
47    ─┤├─────────────────────────────────[RST   Y10        ]
      Network                                     Network
      parameter                                   parameter
      write                                       write request
      completion
      signal
                  X18
                 ─┤├──────────────────────[RST   Y10        ]
                 Parameter                        Network
                 setting                          parameter
                 status signal                    write request
```

<<Cyclic transmission>>

```
       M200
51    ─┤├─────────────────────────────────[$MOV  "MELSEC"   W200       ]
      Cyclic                                                Node 3
      data                                                  cyclic data
      setting                                               (word)
                                                            setting

                                          ─[MOV   H1         K4B200     ]
                                                            Node 3
                                                            cyclic data
                                                            (bit) setting

       M200
70    ─┤/├────────────────────────────────[$MOV  "    "     W200       ]
      Cyclic                                                Node 3
      data                                                  cyclic data
      setting                                               (word)
                                                            setting

                                          ─[MOV   H0         K4B200     ]
                                                            Node 3
                                                            cyclic data
                                                            (bit) setting
```

```
      X19    U0\G2528.3                                   ┌BMOV    W200       U0\     H100 ┐
 79 ──┤├──────┤/├─────────────────────────────────────────         Node 3     G8704        │
    Token     Node list                                            cyclic     Node 3        │
    enter                                                          data       cyclic        │
    status                                                         (word data) data          │
    signal                                                                    area 2         │
                                                          ┌BMOV    K4B200     U0\     H10  ┐
    │                                                     │         Node 3     G7200        │
    │                                                     │        cyclic     Node 3        │
    │                                                     │        data       cyclic        │
    │                                                     │        (bit data)  data          │
    │                                                     │                   area 1         │
      U0\G2528.1                                          ┌BMOV    U0\        K4B0    H10  ┐
    ──┤/├─────────────────────────────────────────────────         G7168      Node 1        │
      Node list                                                    Node 1     cyclic        │
                                                                   cyclic     data          │
                                                                   data       (bit data)     │
                                                                   area 1                    │
                                                          ┌BMOV    U0\        W0      H100 ┐
                                                          │         G8192      Node 1        │
                                                          │        Node 1     cyclic        │
                                                          │        cyclic     data          │
                                                          │        data       (word data)    │
                                                          │        area 2                    │
```

Join node list
(Address: 2528 (9E0$_H$))
Data write to area 2 of node 3
(Address: From 8704 (2200$_H$))

Data write to area 1 of node 3
(Address: From 7200 (1C20$_H$))

Join node list
(Address: 2528 (9E0$_H$))
Data read from area 1 of node 1
(Address: From 7168 (1C00$_H$))

Data read from area 2 of node
1 (Address: From 8192 (2000$_H$))

<<Message transmission, transparent type message send>>

```
      M600    X19                                         ┌$MOV    "SAMPLE_PROGRAM"   D6000 ┐
108 ──┤├──────┤/├──────────────────────────────────────────                           Message
    Mess_Sen  Token                                                                    send
    d         enter                                                                    data
              status
              signal
    │                                                     ┌MOV     K1         U0\          ┐
    │                                                     │                   G24576       │
    │                                                     │                   Another      │
    │                                                     │                   node No.     │
    │                                                     │                   setting for  │
    │                                                     │                   message      │
    │                                                     │                   transmission │
    │                                                     ┌MOV     K10        U0\          ┐
    │                                                     │                   G24577       │
    │                                                     │                   Transaction  │
    │                                                     │                   code         │
    │                                                     │                   setting      │
    │                                                     ┌MOV     H100       U0\          ┐
    │                                                     │                   G24578       │
    │                                                     │                   Send         │
    │                                                     │                   data size    │
    │                                                     │                   setting      │
    │                                                     ┌BMOV    D6000      U0\     H100 ┐
    │                                                     │        Message    G24579       │
    │                                                     │        send       Send         │
    │                                                     │        data       data area    │
    │                                                     ┌SET     Y0                      ┐
    │                                                              Message
    │                                                              transmission
    │                                                              request
```

Another node No. setting for
message transmission
(Address: 24576 (6000$_H$))

Transaction code setting
(Address: 24577 (6001$_H$))

Send data size setting
(Address: 24578 (6002$_H$))

Send data area
(Address: From 24579 (6003$_H$))

```
      X0                                                  ┌RST     Y0                      ┐
157 ──┤├──────────────────────────────────────────────────                 Message
    Message                                                                 transmission
    Transmission                                                            request
    normal
    completion
    signal

      X1      X0                                          ┌RST     M600                    ┐
    ──┤├──────┤├──────────────────────────────────────────                 Mess_Sen
    Message   Message                                                       d
    Transmission Transmission
    abnormal  normal
    completion completion
    signal    signal
              X1                                          ┌BMOV    U0\        D600    K10  ┐
            ──┤├────────────────────────────────────────────       G2519      Transparent  │
              Message                                              Transparent type         │
              Transmission                                         type       message       │
              abnormal                                             message    send result   │
              completion                                           send result storage       │
              signal
170 ───────────────────────────────────────────────────── ┌END                            ┐
```

Transparent type message
send result
(Address: 2519 (9D7$_H$))

7 MAINTENANCE AND INSPECTION

This chapter explains the procedures for maintaining, inspecting and removing the FL-net module.

7.1 Maintenance and Inspection

Other than checking the terminator and cable connections are not loose, there are no specific inspection items for the FL-net module. For the other areas, implement the inspection procedures described in the user's manual for the programmable controller CPU module to maintain the optimum system performance.

⚠ WARNING	• Never touch the terminals or connectors while the power is on. Electrical shock or malfunctioning could result. • Never touch the connectors inside the covered area at the top of the module. Damage or malfunctioning of the module could result. • Shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases before cleaning or retightening terminal screws or module fixing screws. If all phases are not turned off, damage or malfunctioning of the module could occur. If the screws are loose, it could result in a short, malfunction or cause the module to fall off of its mounting. Conversely, if the screws are too tight, the resulting damage to the screw or module could result in a short, malfunction or cause the module to fall off its mounting. • Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module. Failure to do so may cause a failure or malfunctions of the module.

⚠ CAUTION	• Never allow foreign material, such as metal particles or small pieces of wire, to enter the module. It could cause malfunctioning, damage or fire. • Never disassemble or modify the module. It could cause malfunctioning, damage, injury or fire.

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7.2 Removing the Module

Before performing the following operations, read and understand Section 4.2 "Safety precautions during operation." Always keep safety top priority during operation.
The following is the procedure for removing the FL-net module.

<Operating procedure when changing the FL-net module>

(Step 1) Turn the power for the station to which the FL-net module is mounted to OFF.
(Step 2) Remove the network cable and FL-net module.
(Step 3) Follow the instructions in Section 6.3.1 " Procedures up to operation" and start the FL-net module.

<Procedure when changing the CPU>

(Step 1) Use GX Developer to write and save settings related to the FL-net module (I/O tables, IP addresses) and sequence program. (＊1)
(Step 2) Replace the CPU module. (Refer to the user's manual for the CPU module.)
(Step 3) Write the settings for the FL-net module and sequence program that were saved in GX Developer to the CPU module.

＊1: This procedure is not limited to replacing the CPU module. It is recommended that the parameters should be recorded and saved whenever there have been changes or settings made that are related to the FL-net module.

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8 TROUBLESHOOTING

This chapter explains the errors that can occur with the FL-net module and the troubleshooting procedures.

8.1 Is It Really an Error?

Inspect the following items first whenever the FL-net module does not operate properly.

	Contents
1	Is the module properly mounted?
2	Have the settings from the GX Developer been properly set for the module?
3	Has the common memory area been properly set?
4	Is there any looseness or other abnormalities with the connections for the module?
5	Are the communication cables properly connected?
6	Is the terminal resistance for the 10BASE5/10BASE2 cable connected?
7	Is the ground for the 10BASE5/10BASE2 cable connected?
8	Is a cross cable being used for 10BASE-T/100BASE-TX cable?
9	Does the cable meet Category 5 specifications?
10	Is the power on for the Ethernet hub and repeater?

8

8.2 Solutions to General Network Problems

(1) When there is no communication

Check and inspect the following items when there is no communication with the FL-net module.

Location	Item to check	Solution
Power supply	Is the [Power] LED for the power supply for the programmable controller on?	Check the power supply, voltage and if the power supply cable has been pulled out.
	Is the [RUN] LED for the FL-net module on?	Check the power supply, voltage and if the power supply cable has been pulled out.
	Is the power supply lamp for the AUI power supply module on?	Check the power supply, voltage and if the power supply cable has been pulled out.
	Is the output of the power supply for the AUI power supply module the specified voltage (12V)?	Check the power supply, voltage and if the power supply cable has been pulled out.
	Is the power supply lamp for the HUB on?	Check the power supply, voltage and if the power supply cable has been pulled out.
	Is the power supply cable for AUI properly connected to the equipment?	Check the power supply, voltage and if the power supply cable has been pulled out.
Communication cable and transceiver connection	Are any of the mountings for the transceiver unsteady?	Reinstall.
	Is there an error in the equipment used for checking the installation status of the transceiver?	Adjust until normal. If the problem persists, install in a different location.
	Is the transceiver properly insulated?	Reinstall.
	Is the transceiver properly mounted to the markers of the communication cable?	Reevaluate the installation location.
Transceiver cable and transceiver connection	Are any of the mountings for the transceiver cable unsteady?	Reexamine. Tighten as necessary.
	Is there an error in the equipment used for checking the installation status of the transceiver?	Follow the procedures in the operating manual for the inspection equipment and check the installation.
	Is the transceiver properly locked?	Properly lock.
	Do the LEDs for the transceiver indicate normal operation?	Check the power supply, voltage and if the power supply cable has been pulled out.
Transceiver cable and equipment connection	Are any of the mountings for the transceiver cable unsteady?	Reexamine. Tighten as necessary.
	Do the [TX] (send) and [RX] (receive) LEDs indicate normal operation?	Check the description of the error.
	Have the media selection switches (SQE, etc.) been properly set?	Reexamine the settings.

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(2) When communication is unsteady

Check and inspect the following items when the communication by the FL-net module is unsteady.

Location	Item to check	Solution
Transmission route confirmation	Is one point of the outer conductor of the coaxial cable grounded?	Properly ground.
	Is the shield wire of the AUI cable properly grounded?	Ground according to procedure shown in manufacturer's operation manual.
	Does each station properly respond to the PING command?	Check the power supply and cables for each station that does not respond.
	Does the collision lamp come on frequently?	Check the connections of the cable and connectors. Check the errors with an analyzer.
	Are the repeaters four stages or less?	Reevaluate the design.
	Is each segment within the specified length?	Reevaluate the design.
	Are two terminal registers used at both ends?	Reevaluate the design.
	Is the number of equipment connected in a segment within the specified limits?	Reevaluate the design.
	Are there three segments or less connecting the equipment?	Reevaluate the design.
	Is the power on for the repeaters?	Check the power supply, voltage and if the power supply cable has been pulled out.
Confirmation of equipment settings for stations participating in communication	Is the network IP address properly set?	Reconfirm the IP address that has been set using support tool and analyzers.
	Is the station number for the equipment properly set?	Reconfirm the station number that has been set using support tool and analyzers.
	Are the parameters for the equipment properly set?	Reconfirm the equipment that has been set using support tool and analyzers.
	Does the [TX](Send) LED come on continuously or intermittently?	Reconfirm the settings of the equipment.
	Does the [LNK] (Link) LED come on continuously?	Reconfirm the parameter settings of the equipment.

(3) Checking for completion of the initial processing by "PING function"
The following is an example of confirming that initial processing has been
completed by issuing a PING command from the corresponding equipment
(personal computer, etc.) connected to the FL-net (OPCN-2) network to the own
node FL-net module.

\> ping IP address

The following is an example of a program.
(Example) FL-net module IP address: 192.0.1.254

```
─ Normal screen ──────────────────────────────────────────────

        C:\>ping 192.0.1.254    · · · ping command execution

        Pinging 192.0.1.254 with 32 bytes of data:

        Reply from 192.0.1.254: bytes=32 time=1ms TTL=128
        Reply from 192.0.1.254: bytes=32 time<10ms TTL=128
        Reply from 192.0.1.254: bytes=32 time<10ms TTL=128
        Reply from 192.0.1.254: bytes=32 time<10ms TTL=128

        Ping statistics for 192.0.1.254:
                Packets: Sent = 4, Received = 4, Lost = 0 (0 % loss)
        Approximate round trip times in milli-seconds:
                Minimum = 0 ms, Maximum = 1ms, Average = 0 ms

        C:\>_
```

```
─ Error screen ──────────────────────────────────────────────

        C:\>ping 192.0.1.254    · · · ping command execution

        Pinging 192.0.1.254 with 32 bytes of data:

        Request timed out:
        Request timed out:
        Request timed out:
        Request timed out:

        Ping statistics for 192.0.1.254:
                Packets: Sent = 4, Received = 0, Lost = 4 (100 % loss)
        Approximate round trip times in milli-seconds:
                Minimum = 0 ms, Maximum = 0 ms, Average = 0 ms

        C:\>_
```

8.3 FL-net (OPCN-2) General Precautions

Refer to IEEE802.3 for the specifications relating to the transmission route of the FL-net (OPCN-2).

In addition to these, the following are restrictions and precautions unique to the FL-net (OPCN-2).

	Contents
1	Other Ethernet data shall not be handled on communication cables for the FL-net (OPCN-2).
2	Do not connect FL-net (OPCN-2) to a router.
3	A switching HUB will not have any effect even if used for FL-net (OPCN-2).
4	The real-time characteristics of the communication will be dramatically reduced if infrared or other types of wireless media are used.
5	If a personal computer is used, the performance of the personal computer and its operating system and application software will dramatically change the real-time characteristics.
6	Use the preset IP address. There is a need to group network addresses. (Standard network is: 192.168.250) There is the recommended input range for the node number (station number) of the IP address. | Network address	Node Number
192.168.250	1 to 249 | A check for duplicate node numbers cannot be performed during the initial settings. Use care during setting as the first duplicate node number error will occur during communication.
7	Always provide a proper ground. Be sure to use a heavy gauge ground wire.
8	Always install FL-net (OPCN-2) away from sources of electrical noise. Avoid routing cables alongside power cords.
9	When cyclic data communication and message data communication are performed simultaneously, the real-time characteristics will be adversely affected by the volume of the data and other factors.
10	There is no need to continue and keep the cyclic data communication area (common memory area).
11	If there is SQE switch mounted to the transceiver, follow the operator's manual for proper setting.
12	The fixed time communication characteristics of the overall system will be affected by the processing performance of the equipment connected to it. The communication processing speed of all equipment on the network is adjusted to match the communication performance (minimum permissible frame interval) of the slowest equipment. Accordingly, the real-time characteristics of the overall system can be dramatically reduced by connection or addition of one module.
13	The message data communication header section is big endian but the data section is little endian. However, on system parameter that have a profile read data section, it is big endian. (Big endian indicates the method that initially dispatches the MSB (Most Significant Bit).)

8.4 Troubleshooting Flowchart

(1) When data communication is not available
The following is a simple flowchart for troubleshooting when communication cannot be performed with an FL-net module.

```
             ┌─────────────────────────┐
             │  No data communication. │
             └─────────────────────────┘
                          │
                          ▼
    ┌──────────────────────────────────┐
    │ Check if the CPU module for the   │
    │ FL-net module have an error.      │
    └──────────────────────────────────┘
                          │
                          ▼
           ╱────────────────────╲                            ┌──────────────────────────────────┐
          ╱  Has the CPU module   ╲        YES                │ Refer to the section on troubleshooting │
          ╲ generated an error that ╱ ──────────────────────▶ │ in the user's manual for the CPU    │
           ╲ stopped processing?   ╱                           │ module and correct the cause of the │
             ╲       *2         ╱                              │ error.                             │
                    │ NO                                       └──────────────────────────────────┘
                    ▼
    ┌──────────────────────────────────┐
    │ Check the status of the applicable│
    │ FL-net module.                    │
    └──────────────────────────────────┘
                    │
                    ▼
           ╱────────────────╲                                 ┌──────────────────────────────────┐
          ╱  Is the FL-net    ╲        NO                      │ Reset the CPU module.              │
          ╲ module [RUN] LED on? ╱ ───────────────────────────▶│ If the [RUN] LED does not come on even │
           ╲                 ╱                                 │ if the CPU is reset, it is most likely due │
                │ YES                                          │ to a FL-net module hardware error. │
                ▼                                              │ Replace the FL-net module and restart │
                                                               │ all the corresponding equipment that had │
                                                               │ been communicating with local station. │
                                                               └──────────────────────────────────┘
           ╱────────────────╲                                 ┌──────────────────────────────────┐
          ╱ Are all the cables ╲       NO                      │ The cable should be securely locked. │
          ╲ securely connected? ╱ ─────────────────────────────▶└──────────────────────────────────┘
                │ YES
                ▼
           ╱────────────────╲                                 ┌──────────────────────────────────┐
          ╱ Is the operating  ╲        NO                      │ In the intelligent function module │
          ╲ mode set to "online"? ╱ ──────────────────────────▶│ switch setting of GX Developer,    │
                │ YES                                          │ set "0" or "4" (Online) for [Switch 5]. │
                ▼                                              │ (Refer to Section 6.3.2)           │
                                                               └──────────────────────────────────┘
           ╱────────────────╲                                 ┌──────────────────────────────────┐
          ╱ Is the FL-net module ╲      NO                     │ Execute initial process.           │
          ╲ participating with the token ╱ ─────────────────────▶│ (Refer to Section 6.5.1.)          │
           ╲ ([LNK]LED on)?  ╱                                 │ If the [LNK] LED does not come on after │
                │ YES                                          │ performing initial processing, restore │
                ▼                                              │ the error by using the contents of the │
               1)                                              │ error code. (Refer to Section 8.5.2.) │
                                                               │ Confirm the same FL-net protocol   │
                                                               │ version of the connected FL-net    │
                                                               │ modules (including other           │
                                                               │ manufacturer's modules).           │
                                                               │ (Refer to section 3.2.6 (2).)      │
                                                               └──────────────────────────────────┘
```

1)

```
         ┌──────────────────────────┐
NO       │  Is the connection by    │
◄────────┤       10BASE2?           │
         └──────────────────────────┘
                      │ YES
                      ▼
         ┌──────────────────────────┐
         │ Check the ground connection status │
         │ of the power supply module for the  │
         │ station mounted to the FL-net module.│
         └──────────────────────────┘
                      │
                      ▼
         ┌──────────────────────────┐        ┌──────────────────────────────┐
         │     Are the LG-FG        │   NO   │ Ground the LG terminal and FG terminal. │
         │   terminals grounded?    ├───────►│ Start the FL-net module and check the   │
         └──────────────────────────┘        │ communication with corresponding         │
                      │ YES                   │ equipment. (＊1)                          │
                      ▼                       └──────────────────────────────┘
         ┌──────────────────────────┐
         │ Check for errors in each of the    │
         │ communicating processes and restore.│
         └──────────────────────────┘
```

＊1 When the LG terminal and FG terminal for the power supply module for the station to which the FL-net module is
     mounted have not been set, the communication line may close because of noise stopping communication
     with corresponding equipment. Turn off the power supply to the station for the FL-net module and refer to
     the section on wiring in the user's manual for the CPU module for grounding terminals LG and FG on the power
     supply module.

＊2 If SP.UNIT DOWN(1403) occurs on CPU module mounted on the base with FL-net module, FL-net module may
     be in high loaded status due to receiving frames through the network.
     Setting "Minimum permissible frame interval" reduces the load caused by FL-net communication. If any Ethernet
     device other than FL-net device is connected to FLnet(OPCN-2), remove it from FL-net(OPCN-2).

(2) When repeatedly joining and leaving the network
The following is a simple flowchart for troubleshooting in the case that the module is repeatedly joining and leaving the network.

Repeatedly joins and leaves network.

Repeatedly joining and leaving network?
— NO → OK
— YES →

Does the system use QJ71FL71-T-F01 and have both 10 BASE-T and 100BASE-TX?
— NO →
— YES →

Is it "Online (auto-negotiation)" mode?
— NO →
— YES →

Auto-negotiation count (address: B7A$_H$ to B7B$_H$) counted up?
— NO →
— YES →

• Check set values of Token monitoring timeout time (address: C$_H$) and Minimum permissible frame interval (address: D$_H$).
• Check cables and hubs.
• Perform self-loopback test. (Refer to Section 6.3.1.)

• In Intelligent function module switch setting of GX Developer, set "Switch 5" to "0" (10Mbps, half-duplex). (Refer to Section 6.3.2.)
• Check cables and hubs.
• Perform self-loopback test. (Refer to Section 6.3.1.)

8.5 Errors and Their Solutions

This section explains FL-net module errors and their solutions.

| REMARK |

If line errors occur when equipment from different manufacturers are connected, Sort out the causes with a line analyzer or such equipment.

8.5.1 Confirming errors using the LEDs

The following explains how to confirm errors using the LEDs in the front of the FL-net module.
The following can be confirmed by using the LEDs in the front of the FL-net module.

The QJ71FL71-T-F01

```
RUN □    □ PER
     □    □
LNK □    □ 100M
 TX □    □ RX
```

Other than the QJ71FL71-T-F01

```
RUN □    □ PER
     □    □
LNK □    □
 TX □    □ RX
```

	LED name	Confirmation status	Cause/solution
1	[RUN]	Goes off after power supply for programmable controller is turned on.	1) Watchdog timer error • The watchdog timer error detection signal (X1F) is set to on by the self-diagnosis function of the FL-net module when there has been a watchdog timer error (approx. 500 ms). 2) FL-net module mounting defect • Confirm that there is sufficient power supply capacity (5 V DC). • Turn the power off and mount the module.
2	[PER]	Goes on after power supply for programmable controller is turned on.	1) FL-net module setting error Check the following settings. • Mode • Node number • Common memory first address / size setting 2) FL-net module error ($*^1$)
3	[TX]	[TX] LED is not flashing during [LNK] LED is on.	1) [PER] LED on • Remove the cause of the [PER] LED coming on. 2) Reevaluate the program • Reexamine the network parameter settings.

∗1: Perform a hardware test to determine whether or not the FL-net module is operating normally.(Refer to Section 6.3.1 (1).)

	LED name	Confirmation status	Cause/solution
4	[RX]	[RX] LED is off and cannot receive data	1) [PER] LED on • Remove the cause of the [PER] LED coming on. 2) Defective cable connection • Check the cable connections.($*2$) 3) Local station IP address error • If no problem was found with the cable connection, reexamine the IP address settings for the FL-net module.

$*2$: Perform a loopback test to determine if there is a problem with the cable connections or the Ethernet line.
   (Refer to Section 6.3.1.(1))

8.5.2 Confirming errors using error code

The following introduces the processes the FL-net module uses for communicating data and the error codes and their contents generated during processing requests from the local node CPU.
Error code can be confirmed with the system monitor for the GX Developer. (Refer to Section 8.6.)

(1) Error code list

Error code	Contents
0$_H$	Normal
3E8$_H$ to 4FFF$_H$	CPU module detecting error number
C000$_H$ to CFFF$_H$	FL-net module detection error number

(2) Error codes stored in buffer memory
The following introduces the errors in the processes used by the FL-net module for communicating data and the contents and corrective action for the error codes stored when they have been stored in the buffer memory.
The "Destination storage" in the error code table shows the buffer memory where the applicable error code has been stored. The relationship between the descriptive name used for the "destination storage" and the buffer memory area is shown below. (Error codes without the destination storage are error codes to be returned to the corresponding equipment.)

Descriptive name	Buffer memory	Buffer memory address
Switch	Intelligent function module switch setting status	9C6$_H$
Parameter setting	Network parameter setting status	9D2$_H$
Parameter results	Network parameter read results	9D3$_H$
Profile results	Device profile read results	9D4$_H$
Log clear results	Log data clear results	9D5$_H$
Log data results	Log data read results	9D6$_H$
Message results	Transparent message transmission results	9D7$_H$

Error code	Description of error	Corrective action	Switch 9C6$_H$	Parameter settings 9D2$_H$	Parameter settings 9D3$_H$	Profile results 9D4$_H$	Log clear results 9D5$_H$	Log data results 9D6$_H$	Message results 9D7$_H$
3E8$_H$ to 3FFF$_H$	(Error detected by CPU module)	• Refer to the troubleshooting section of the CPU user's manual and take an appropriate action.							
4000$_H$ to 4FFF$_H$	(Error detected by CPU module)	• Refer to the Appendix of the QCPU user's manual and take an appropriate action.							
C001$_H$	FL-net module's OS error	• Replace the FL-net module.							
C003$_H$	Wrong IP address (network address) setting	• Correct the IP address.	○						
C004$_H$	Wrong IP address (host address) setting	• Correct the IP address.	○						

The columns above the table are headed by "Destination strage".

(Continued on next page)

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Error code	Description of error	Corrective action	Storage destination						
			Switch 9C6H	Parameter settings 9D2H	Parameter settings 9D3H	Profile results 9D4H	Log clear results 9D5H	Log data results 9D6H	Message results 9D7H
C005H	Wrong mode number setting	• Correct the mode number.	○						
C021H	Wrong IP address (network address) setting	• Correct the IP address.		○					
C022H	Wrong IP address (host address) setting	• Correct the IP address.		○					
C023H	Wrong setting value for common memory area 1 first address	• Correct setting value for common memory area 1 first address and perform initial process again.		○					
C024H	Wrong setting value for common memory area 1 size	• Correct setting value for common memory area 1 size and perform initial process again.		○					
C025H	Setting value for common memory area 1 first address and size out of permissible range	• Correct setting value for common memory area 1 first address and size and perform initial process again.		○					
C026H	Wrong setting value for common memory area 2 first address	• Correct setting value for common memory area 2 first address and perform initial process again.		○					
C027H	Wrong setting value for common memory area 2 size	• Correct setting value for common memory area 2 size and perform initial process again.		○					
C028H	Setting value for common memory area 2 first address and size out of permissible range	• Correct setting value for common memory area 2 first address and size and perform initial process again.		○					
C029H	Wrong setting value for token monitoring time out time	• Correct setting value for token monitoring time out time and perform initial process again.		○					
C02AH	Wrong setting value for minimum permissible frame interval	• Correct setting value for minimum permissible frame interval and perform initial process again.		○					
C02CH	Setting for common memory area overlaps other node setting range	• Correct setting value for common memory.		○					
C02DH	Wrong message data unit selection	• Correct selection for message data unit.		○					
C104H	Multiple CPU system No.1 to 4 error	• Confirm the error code of the PLC No.1 to 4, and remove the factor of the error.							
C105H	Error occurred in the interface with the multiple CPU system No.1	• Confirm the error code of the PLC No.1, and remove the factor of the error.							
C106H	Error occurred in the interface with the multiple CPU system No.2	• Confirm the error code of the PLC No.2, and remove the factor of the error.							

(Continued on next page)

(Continued from previous page)

Error code	Description of error	Corrective action	Storage destination						
			Switch 9C6H	Parameter settings 9D2H	Parameter settings 9D3H	Profile results 9D4H	Log clear results 9D5H	Log data results 9D6H	Message results 9D7H
C107H	Error occurred in the interface with the multiple CPU system No.3	• Confirm the error code of the PLC No.3, and remove the factor of the error.							
C108H	Error occurred in the interface with the multiple CPU system No.4	• Confirm the error code of the PLC No.4, and remove the factor of the error.							
C112H	Error occurred in the interface with the multiple CPU system's control CPU.	• Confirm the error code of the control CPU, and remove the factor of the error.							
C321H	Setting value for target node number out of permissible range	• Correct setting value for applicable target node number.			○	○	○	○	○
C322H	Target node does not exist	• Correct setting value for applicable target node number. • Confirm operation of corresponding equipment.			○	○	○	○	○
C323H	No response from target node for 10 seconds or more	• Correct setting value for applicable target node number. • Confirm operation of corresponding equipment.			○	○	○	○	○
C324H	Error in send data	• Correct send data.							○
C325H	FL-net module does not support process indicated in transaction code	• Correct transaction code.							○
C326H	No empty capacity in target node buffer	• Create space and re-execute.				○	○	○	○
C327H	Request is broadcast message	• Correct the node number.				○			
C328H	Not joining in token	• Check the status of the programmable controller and wire status. • Re-evaluate the settings for the initial process.			○	○	○	○	○
C329H	Transaction code is X/Y handshake specification	• Correct the transaction code.							○
C421H	Setting value for virtual address space word length out of permissible range	• Re-evaluate the request data.							○
C422H	Address setting value for virtual address space out of permissible range	• Re-evaluate the request data.							○
C423H	Word block read request data size is not "0"	• Re-evaluate the request data.							○

(Continued from previous page)

Error code	Description of error	Corrective action	Storage destination						
			Switch 9C6H	Parameter settings 9D2H	Parameter settings 9D3H	Profile results 9D4H	Log clear results 9D5H	Log data results 9D6H	Message results 9D7H
C424H	Byte length for receive message out of permissible range	• Re-evaluate the request data.							○
C425H	Address setting for receive message range out of permissible range	• Re-evaluate the request data.							○
C42BH	No response from other node for 10 seconds or more	• Re-evaluate the source node for the address.							○
C501H	Self-loopback error	• Re-evaluate the cable.							
C502H	Hardware error	• Replace the FL-net module.							
C503H	Hardware error	• Replace the FL-net module.							

8.6 System Monitor

The FL-net module status can be checked from system monitor.

(1) Startup procedure

GX Developer → [Diagnostics] → [System monitor…] →
Module's Detailed Information

```
┌─ Module's Detailed Information ──────────────────────────[X]─┐
│ ┌─ Module ──────────────────────────────────────────────┐ │
│ │ Module Name        QJ71FL71-T-F01      Product information  060520000000000 - B │ │
│ │ I/O Address        0                                        │ │
│ │ Implementation Position  Main Base  0Slot                  │ │
│ └────────────────────────────────────────────────────────┘ │
│ ┌─ Module Information ──────────────────────────────────┐ │
│ │ Module access          Possible      I/O Clear / Hold Settings    ---- │ │
│ │ Status of External Power Supply ----  Noise Filter Setting        ---- │ │
│ │ Fuse Status             ----          Input Type                  ---- │ │
│ │ Status of I/O Address Verify  Agree   Remote password setting status ---- │ │
│ └────────────────────────────────────────────────────────┘ │
│ ┌─ Error Display ───────────────────────────────────────┐ │
│ │ ┌──┬──────────┐                        ┌─ Display format ─┐ │ │
│ │ │No.│Error Code│ Present Error  C005    │ (•) HEX  ( ) DEC │ │ │
│ │ │ 1 │ C005     │                        └──────────────────┘ │ │
│ │ ├──┼──────────┤    [ Error History ]                      │ │
│ │ │  │          │                                            │ │
│ │ │  │          │  The display sequence of the error history is from the oldest error. │ │
│ │ └──┴──────────┘  The latest error is displayed in the line as under. │ │
│ │  ┌─ Error contents - Disposal ────────────────────────┐ │ │
│ │  │ Contents: │Wrong mode number setting              ▲│ │ │
│ │  │           │                                       ▼│ │ │
│ │  │ Disposal: │Correct the mode number.               ▲│ │ │
│ │  │           │                                       ▼│ │ │
│ │  └────────────────────────────────────────────────────┘ │ │
│ └────────────────────────────────────────────────────────┘ │
│ [ H/W Information... ]  [ Start monitor ]  [ Stop monitor ]  [ Close ] │
└──────────────────────────────────────────────────────────────┘
```

(2) Display details

Item		Description
Module	Module Name	Displays the model name of the target module.
	I/O Address	Displays the start I/O No. of the target module.
	Implementation Position	Displays the slot position in which the module is installed.
	Product information	Displays serial No. and function version of the target module. *1
Module Information	Module access	Displays that it is accessible when Module ready (X1C) is ON, or when Watch dog timer error detection signal (X1F) is OFF.
	Status of I/O Address Verify	Displays whether the module for which the user has set parameters matches the one installed or not.
Error Display	Present Error	Displays an error code of the latest error. (Refer to Section 8.5.2.)
	Error Display	Displays the latest 16 error codes stored in the buffer memory (Address: 9C6H, 9D2H to 9D7H).
Error contents-Disposal	Contents	For the error code selected at Error Display, displays the error description and its corrective action. *2
	Disposal	

*1: The suffix of Product information shows the function version of the module.
    Example: The suffix of "B" means that the module is function version B.
*2: The Error contents-Disposal is displayed in GX Developer Version 8.17T or later.

8.7 H/W Information

Details about FL-net module LED information and switch information can be monitored using H/W information on GX Developer. To display Hardware data, select: Diagnosis → System monitor → Module detailed information and click $\boxed{\text{H/W Information…}}$.

The H/W information will be shown on the following screen.
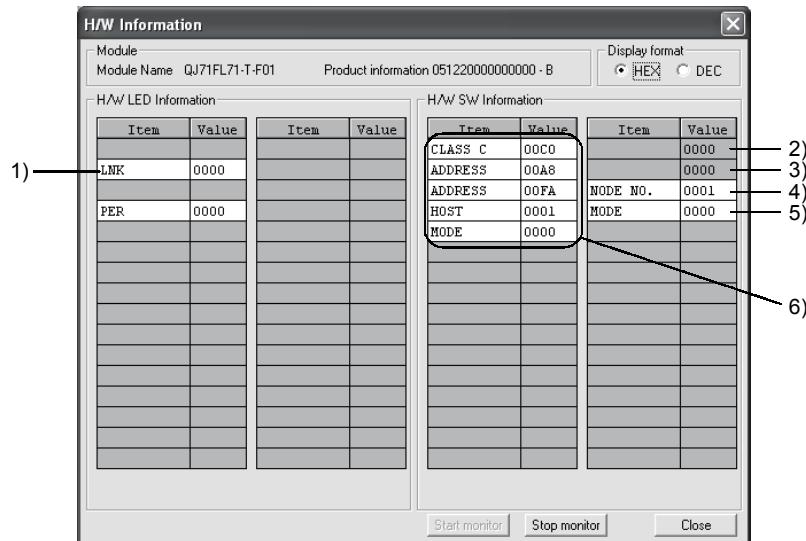
The following items are shown.

1) Actual LED information
   Displays information about the LED that are on for the FL-net module.
   • LNK 0000: OFF   0001 : ON
   • PER 0000: OFF   0001 : ON

2), 3) System information
   Displays system information about the FL-net module.

4) Node number switch information
   Displays the node number (4 digits of IP address) that have been set in FL-net module.
   Display range : 1 to 254

5) Mode number switch information
   Displays the mode number that has been set in the FL-net module.

Mode number	Contents
0	Online
1	Offline
2	Loopback test
3	Hardware test
4	Online (Auto negotiation)

6) Intelligent function module switch setting
   Displays the Intelligent function module switch settings that have been set in I/O assignment settings in the parameters for the GX Developer.
   • CLASS C to HOST: IP address settings
   • MODE: Operating mode settings (Refer to 5) in this section.)

APPENDICES

Appendix 1 Transition from QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 to QJ71FL71-T-F01/QJ71FL71-B5-F01/QJ71FL71-B2-F01

The sequence programs and network devices for QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 are compatible with the QJ71FL71-T-F01/ QJ71FL71-B5-F01/QJ71FL71-B2-F01.

However, they cannot be connected together because FL-net (OPCN-2) Version 2.00 is not compatible with FL-net (OPCN-2) Version 1.00.

Item	Applicability
Sequence program	Applicable
Network device (transceiver, cable and similar device)	Applicable
Connecting both FL-net (OPCN-2) Version 2.00 and FL-net (OPCN-2) Version 1.00 on the same network	N/A *[1]

*1: Since the FL-net protocol of FL-net (OPCN-2) Version 2.00 modules is different from that of FL-net (OPCN-2) Version 1.00 modules, the following two types of modules cannot communicate each other.

FL-net (OPCN-2) Version 2.00 module	FL-net (OPCN-2) Version 1.00 module
QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, Version 2.00 products from other manufacturers	QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2, Version 1.00 products from other manufacturers

A

Appendix 2 Upgrading the Functions from the QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 to the QJ71FL71-T-F01/QJ71FL71-B5-F01/QJ71FL71-B2-F01

Function version B of the QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 contains functions that are revisions of and additions to the current version (version A).
This section explains a comparison of the module functions, program use and incorporating into the existing system along with these additions and revisions.

Appendix 2.1 Comparison of module functions

This shows the functions that have been added to or changed in version B.
• Transparent message transmission (Refer to 6.2.8.(6) (h) and 6.5.3.(5) (6))
• Parameter settings using the GX Configurator-FL (Refer to Section 6.4)
• Multiple CPU system (Refer to Section 3.3)

Appendix 2.2 Precautions when replacing from function version A to function version B

This section explains using programs created for function version A and incorporating them into previous systems.

(1) Using the program
It is possible to use a program for function version A as is on a function version B.

(2) Incorporating into existing system
It is possible to use a program created for use on function version B as is on the cables for used for function version A.

Appendix 2.3 Precautions when mixing modules with function versions A and B

This section explains the precautions when mixing function version A and function version B.

(1) Transparent-type message transmission
Use word units when performing a transparent-type message transmission from a function version B to a function version A. (Refer to Section 6.2.8.(6) (h) and 6.5.3.(5) (6))

(2) GX Configurator-FL
Function version A QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 are not compatible with GX Configurator-FL. Use the sequence program to set the parameters.

A

Appendix 3 Guide to System Configuration

Appendix 3.1 Overview of Ethernet

Ethernet is a standard for Local Area Network (LAN) used for communication among computers, printers and other such devices. It sets the standards for formatting the data for communication, the cables, connectors and other components.

The standard for Ethernet is defined by IEEE Ethernet working group: IEEE802.3, and is the standard that defines formats such as 10BASE5, 10BASE2 and 10BASE-T. At present, there are also researches into standards for new formats such as 1000BASE-T. The following shows the trends in standardization of the IEEE802.3 working group.

ISO/IEC approved	ISO/IEC 8802-3 : 1996(E)5th edition Published 7/96		

ANSI/IEEE approved

ANSI/IEEE Std. 802. 3-1998   Published 10/98
- 10BASE-T PICs
- MAU Mgmt.
- Rptr Mgmt.
- GDMO of LM
- FO & Sys. Cons.
- 120 Ohm annex
- 150 Ohm annex
- CSMA/CD Overview
- MAC
- Repeater
- PLS/AUI
- MAUs (B5,B2,BT,BrB)
- Mgmt.
- 1BASE5 Specifications
- Maint. 2,3 & 4

Clauses 1 through 20

- 10BASE-T
- 100BASE-T2
- Full Duplex
- Gigabit Ethernet
- Maint. 5 (100BASE-T)

Clauses 21 through 42

1802.3 Document Set

IEEE Std. 1802.3 Conformance Test
• AUI Cable

IEEE Std. 1802.3d Conformance Test
• 10BASE-T

Network Systems Tutorial

published June 95

. 3ac
Changes for VLANs

Approved 09/98

. 3
Policy and Procedures

Approved 11/97

I802.3 WG in process

. 3ab
1000BASE-T

WG Conf Ballot Closed 11/98

. 3ab
Link Aggregation

PAR approval 06/98

Liaison 802.1

Liaison 802.14 CATV

As of Nov '98 : quote from IEEE web site

Appendix 3.2 10BASE5 specifications

10BASE5 is a method of connecting an Ethernet system with a coaxial cable that is approximately 10 mm in diameter (often called thick cable or yellow cable). The "10" as in 10BASE5 indicates the transmission speed which is 10Mbps. The "BASE" indicates that the transmission method is a base band format. And the "5" indicates that the transmission distance of the main cable is 500 m. A transceiver is connected to the coaxial cable when Personal computer and other such equipment is connected to the system. A transceiver cable, commonly called an AUI cable, is used for the connection between the equipment and the transceiver.

Since the thick cables of the 10BASE5 system make it difficult to layout a network, it is not used in offices very often. It is most commonly used as the main line network for applications requiring transmission over long distances.

The following shows the example of 10BASE5 configuration.

Coaxial cable
(Maximum cable length : 500 m)

Transceiver port transceiver

Ground terminal

Terminal resistor

Multi-port transceiver

- If a multi-port transceiver is used, the maximum overall AUI cable length from the coaxial cable to the terminal is 50 m.
- Multi-port transceiver cascade connections can be up to 2 levels.
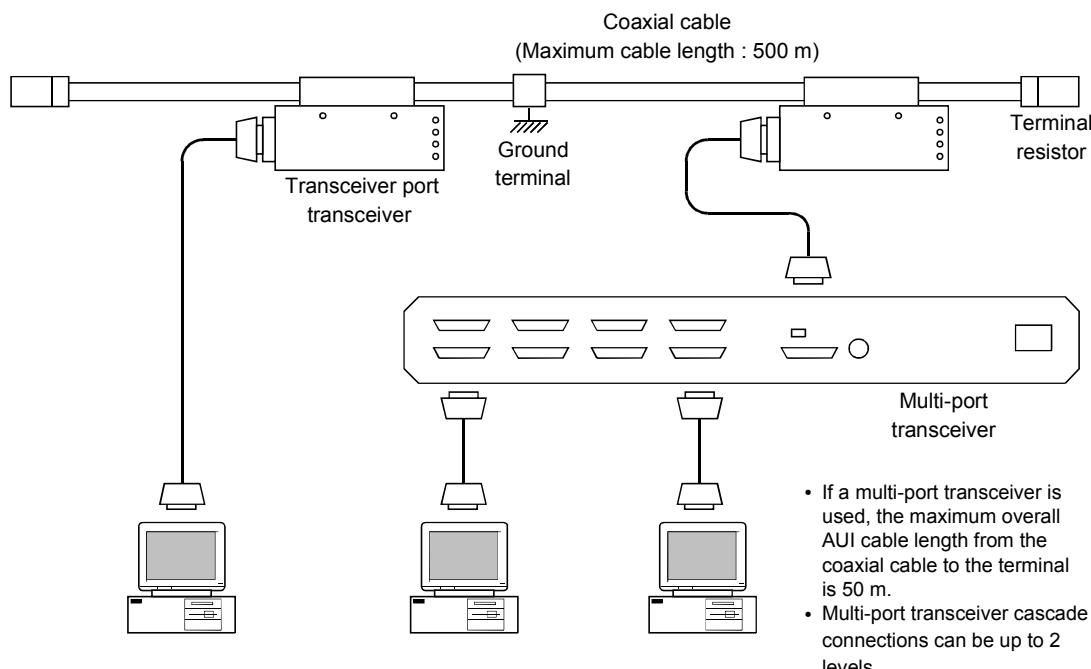
Appendix 3.3 10BASE-T/100BASE-TX specifications

10BASE-T/100BASE-TX is a method of connecting an Ethernet system with twisted pair cables. The "10" as in 10BASE-T indicates the transmission speed which is 10Mbps. The "BASE" indicates that the transmission method is a base band format. And the "-T" indicates that the twisted pair cable is used as the transmission medium. 10BASE-T/100BASE-TX networks require a hub in a star configuration for connecting personal computer and other such equipment and the equipment cannot be directly connected to each other. The cable from the hub to each piece of equipment can be up to 100 m long. Since the cables of the 10BASE-T/100BASE-TX are thin and relatively easy to route and since each piece of equipment can be connected or disconnected to the network individually, this is a popular network system for office applications.

The following shows the example of 10BASE-T configuration.
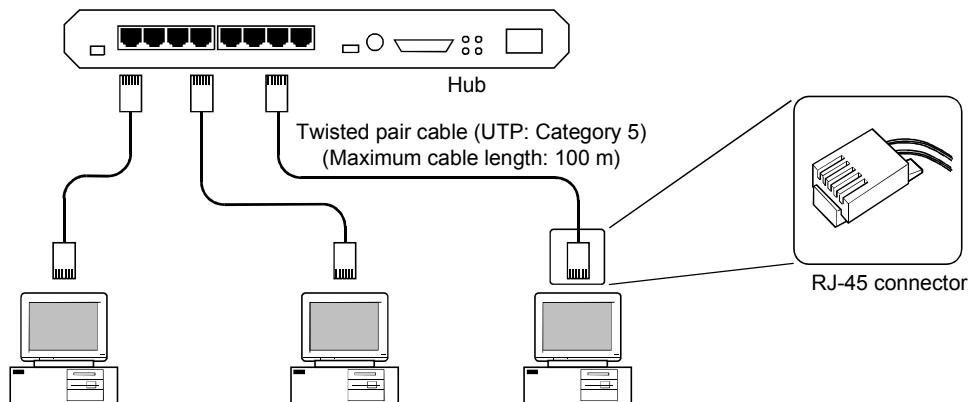
Appendix 3.4 10BASE2 specifications

10BASE2 is a method of connecting an Ethernet system with a coaxial cable that is approximately 5mm in diameter (often called the thin cable). The "10" as in 10BASE2 indicates the transmission speed which is 10Mbps. The "BASE" indicates that the transmission method is a base band format. And the "2" indicates that the transmission distance of the main cable is 185 m (approximately 200 m). Each personal computer and other equipment are connected with a T-shaped branch connector on the BNC cable. The coaxial cable is connected to both ends of this T-shaped branch connector.

The following shows the example of 10BASE2 configuration.

Coaxial cable (RG58A/U or RG58C/U)
(Maximum cable length is 185 m)

Branch
connector
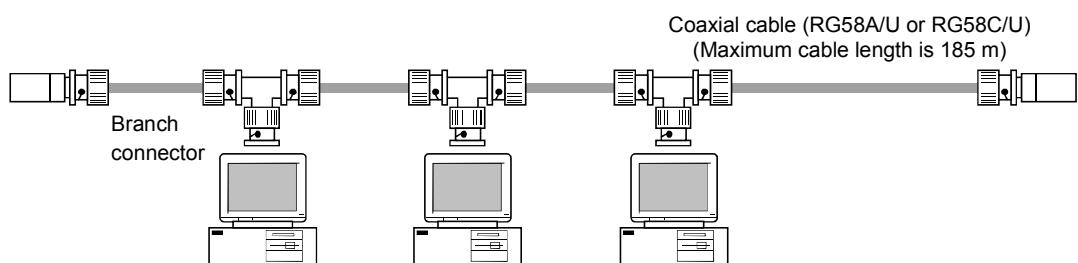
Appendix 3.5 Other Ethernet specifications

(1) Optical Ethernet

Optical Ethernet uses fiber optics as the medium of transmission. It can transmit data in distance exceeding 500 m and is resistant to electrical noise. IEEE802.3 has standardized the optical Ethernet connection method as 10BASE-FP, 10BASE-FB, 10BASE-FL, 100BASE-FX, 1000BASE-LX and 1000BASE-SX. The following shows the example of optical Ethernet configuration.
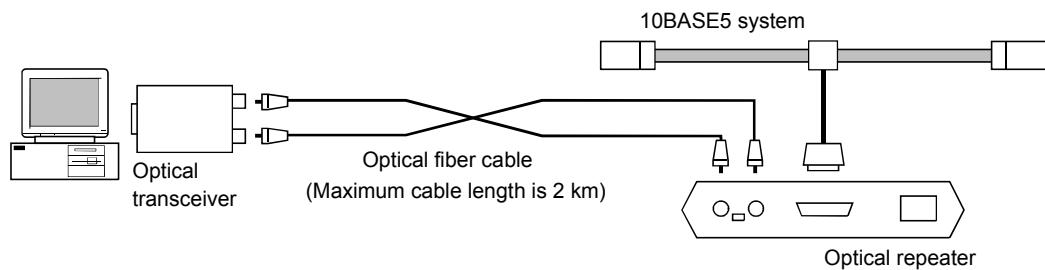
(2) Wireless Ethernet

Wireless LAN uses radio waves or infrared rays as the medium of transmission. It allows portable devices to be connected to a LAN system. The standardization for wireless LAN is planned to process by IEEE wireless LAN working group: IEEE802.11. Wireless LAN has a different MAC layer protocol which necessitates the use of a bridge for interconnection.
The following shows the example of wireless LAN configuration.
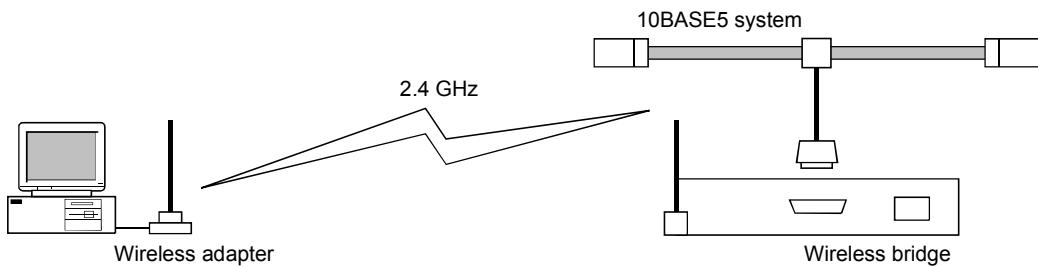
Appendix 4 Examples of System Configuration

Appendix 4.1 Small-scale configuration

A network system can be configured by connecting equipment to a single multi-port transceiver or a HUB.

Multi-port transceiver
AUI cable
(Maximum cable length is 50 m)
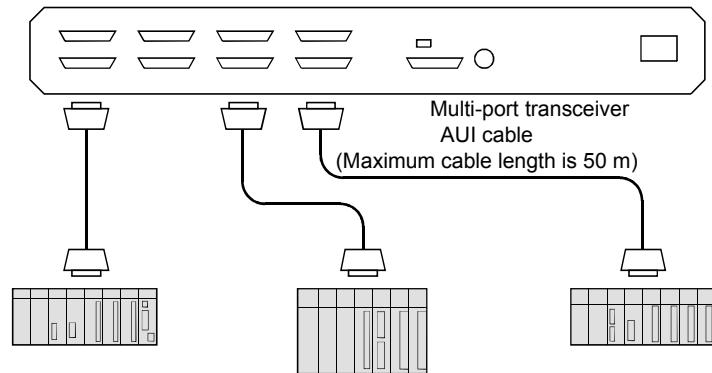
(a) When using a multi-port transceiver.

Hub

Twisted pair cable (UTP: Category 5)
(Maximum cable length is 100 m)
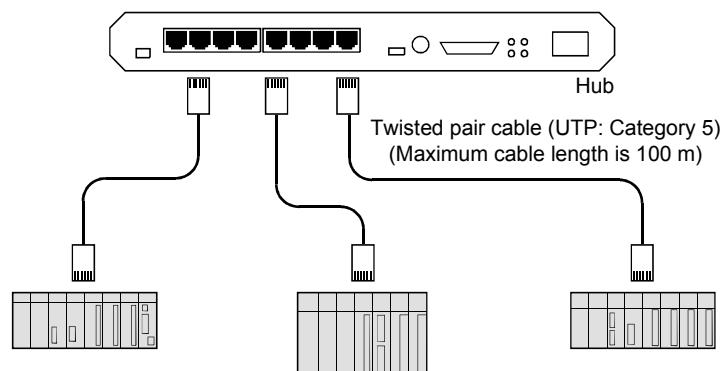
(b) When using a HUB

Appendix 4.2 Basic configuration

Several multi-port transceivers or HUBs are connected to one coaxial cable so that the network can consist of a large number of equipment.
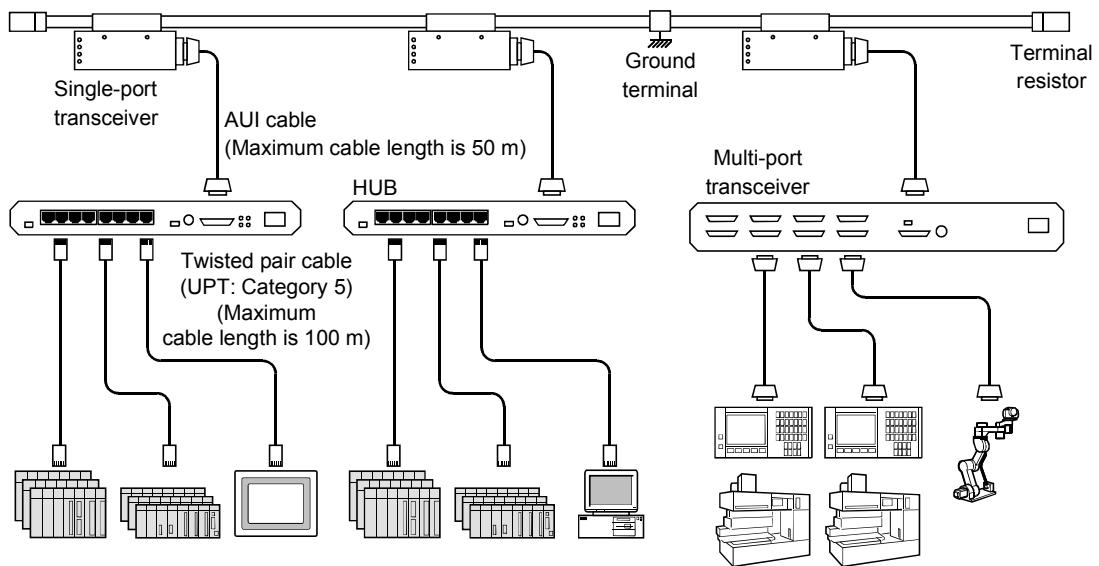
- Up to a total of four repeaters or HUBs can be installed between any two given terminals.

- If a multi-port transceiver is used, the maximum overall length of the AUI cable from the coaxial cable to the terminal is 50 m.
- Multi-port transceiver cascade connections can be up to 2 levels.

Appendix 4.3 Large-scale configuration

Several 10BASE5 networks sections are connected by repeaters to form a network system that can incorporate several hundred pieces of equipment.

- If a multi-port transceiver is used, the maximum overall length of the AUI cable from the coaxial cable to the terminal is 50 m.
- Multi-port transceiver cascade connections can be up to 2 levels.
- Up to a total of four repeaters or HUBs can be installed between any two given terminals.
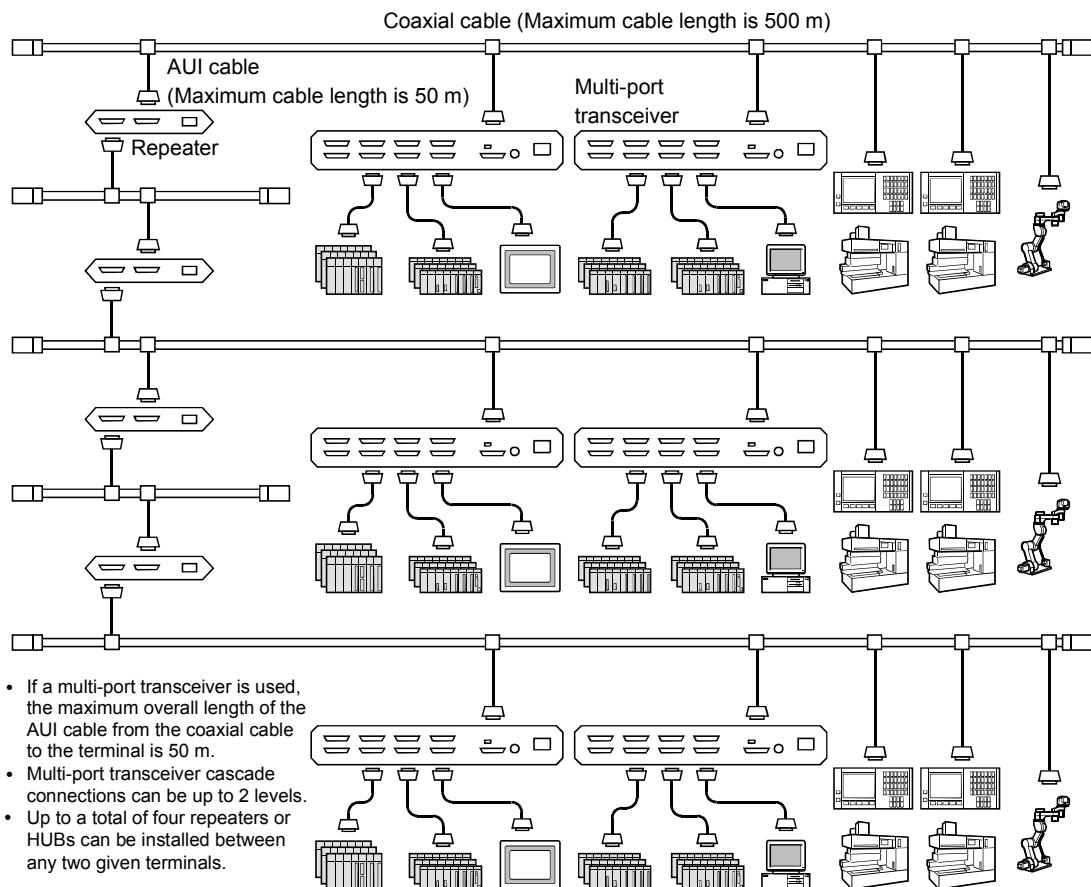
Appendix 4.4 Long-distance distributed configuration

When the distance between the network segments in a large-scale network system exceeds the limitations of the 10BASE5 transmission distance (500 m), the segments of the network can be linked by optical fiber cable that can provide up to 2 km between repeaters.

Coaxial cable (Maximum cable length is 500 m)

AUI cable
(Maximum cable length is 50 m)

Multi-port
transceiver

Optical repeater

Optical fiber cable
(Maximum cable
length is 2 km)

• If a multi-port transceiver is used, the maximum overall length of the AUI cable from the coaxial cable to the terminal is 50 m.
• Multi-port transceiver cascade connections can be up to 2 levels.
• Up to a total of four repeaters or HUBs can be installed between any two given terminals.

Appendix 4.5 Local centralized configuration

When many pieces of equipment are centralized locally, stackable HUBs can be used when configuring the network system.

HUB

Stackable HUB

Twisted pair cable
(UTP: Category 5)
(Maximum cable
length is 100 m)
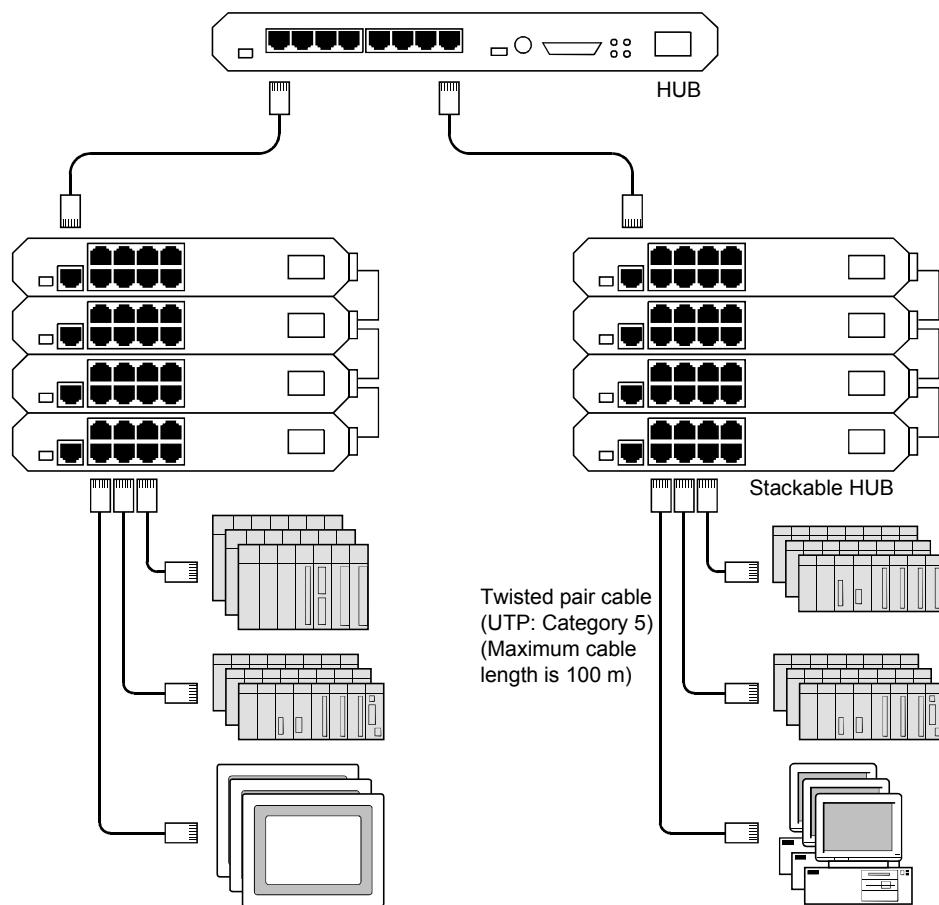
Appendix 4.6 Local and long-distance dispersed configuration

This is a basic network system divided into two segments and then connected by optical repeaters. This design is used when the controller is located away from the network or when there are a high voltage power sources or other sources of electrical noise near the network. The linking of the two segments by optical repeater allows them to be far from each other while offering exceptional resistance to electrical noise.
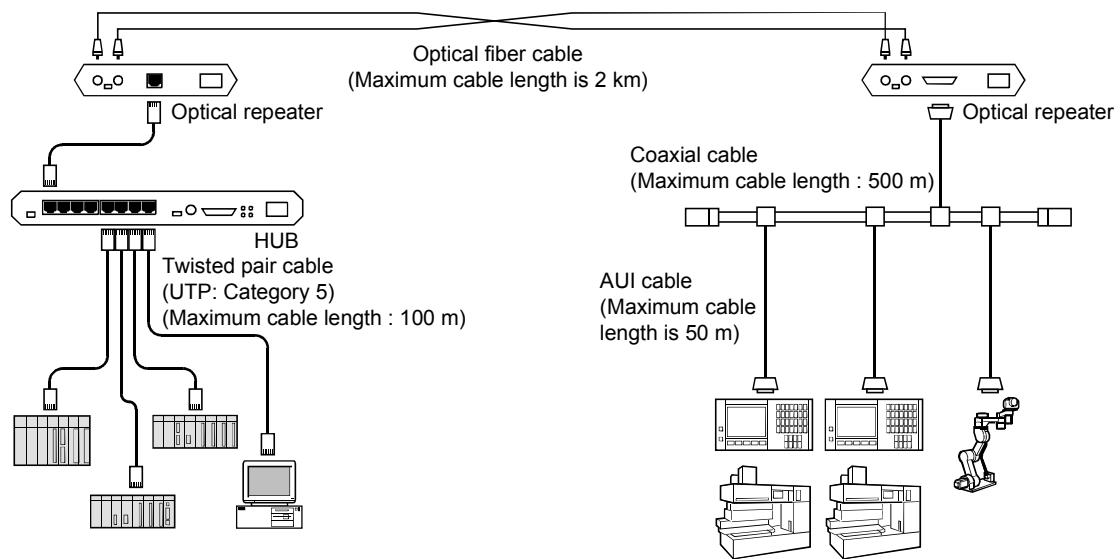
Appendix 4.7 Basic concepts of the FL-net (OPCN-2) system

The FL-net (OPCN-2) is intended to provide real-time communication among controllers such as the programmable controllers, robot controllers and numerical control devices found in manufacturing systems.
FL-net (OPCN-2) is designed for simultaneous broadcast using a token passing mechanism with upon Ethernet UDP/IP protocol in addition, cyclic communication and message communication can be performed.

Appendix 4.8 Differences between conventional Ethernet and FL-net (OPCN-2)

(1)　Since FL-net (OPCN-2) is a network system for the factory automation field, some general-purpose Ethernet equipment can not be used with it. Some equipment with noise resistance characteristics and environmental resistance characteristics are not appropriate for FL-net (OPCN-2) system.

(2)　Since the FL-net (OPCN-2) is required to provide the response performance that gives it the ability for real-time communication for controller applications, it can be connected to FL-net (OPCN-2) compatible controllers or controller equipment alone.

(3)　Since the FL-net (OPCN-2) is a cyclic communication method that uses the simultaneous broadcast functions of UDP/IP communication found in 10BASE5 and 10BASE-T/100BASE-TX, the following restrictions apply under its current protocol.

(a)　Currently compatible equipment can only be used with 10Mbps/100Mbps Ethernet LAN.

(b)　It cannot be connected to other general-purpose Ethernet systems.

(c)　It does not support the TCP/IP communication functions.

(d)　A switching HUB can be used but it will be ineffective.

(e)　Some functions may not be executable when a router or other such equipment is used.

Appendix 5 Network System Definitions

Appendix 5.1 Communication protocol standards

Communication protocol is the rules for one system to exchange data with another system over communication wires. The communication protocol used by FL-net (OPCN-2) conforms to the following standards.

Communication protocol for FL-net (OPCN-2)	Applicable standards
FL-net (OPCN-2)	FA link protocol specifications (Issued by the FA open promotion convention and special committee for FA control networks)
UDP	RFC768
IP, ICMP, etc.	RFC791, 792, 919, 922, 950
ARP, etc.	RFC826, 894
Ethernet	IEEE802.3

Appendix 5.2 Communication protocol layer structure

Communication protocol has been made into a model based on a layered structure and communication processing is divided and organized into several levels for expression and standardization. FL-net (OPCN-2) is comprised of the six protocol layers shown below.

Application layer		Controller · Interface		
FA Link protocol layer		Cyclic transmission	Service function	FL-net (OPCN-2) Protocol
			Message transmission	
		Token function		
Transport layer		UDP		
Network layer		IP		
Data Link layer		Ethernet (Accordance with IEEE 802.3)		
Physical layer				
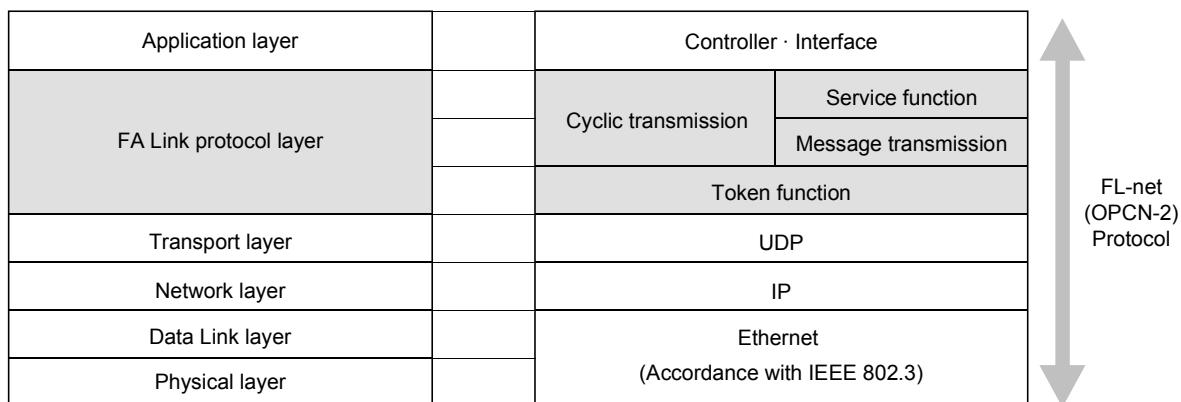
Appendix 5.3 FL-net (OPCN-2) physical layer

When the transmission speed is 10 Mbps, there are 5 types of transmission methods in the physical layer of the Ethernet. These are: 10BASE5, 10BASE2, 10BASE-T, 10BASE-F and 10BROAD36 (although it is not very popular). There is also a 100 Mbps Ethernet. Of these types, 10BASE5 (recommended), 10BASE2 and 10BASE-T/100BASE-TX can be used in FL-net (OPCN-2).

Appendix 5.4 FL-net (OPCN-2) IP address

An address, called an IP address (INET address), is used to identify a specified communication device from among all the communication devices connected to an Ethernet system. Accordingly, a unique IP address must be set for each communication device on the system.

An IP address is comprised of two sections. A section that expresses the network address and a section for the host address. Depending on the size of the network, it can be classified into one of three network classes, Class A, B or C. (Note that there are also Class D and Class E for special purposes.)

	First address octet value	Network address section ($*^1$)	Host address section ($*^1$)
Class A	0 to 127	[xxx.] xxx. xxx. xxx	xxx.[xxx. xxx. xxx]
Class B	128 to 191	[xxx. xxx.] xxx. xxx	xxx. xxx.[xxx. xxx]
Class C	192 to 223	[xxx. xxx. xxx.] xxx	xxx. xxx. xxx.[xxx]

$*$1: The part enclosed by the rectangular is the section corresponding to each of the address sections.

In one network, the IP addresses of the communication devices that are connected to that network will all have the same network address section and the host address section will be a unique value.

The FL-net (OPCN-2) IP address default value is 192.168.250.n (n is the node number: 1 to 254). It is recommended that IP address class C be used and that the lower position host address and the FL-net (OPCN-2) protocol node number be matched.

2^{31}	2^{30}	2^{29}	2^{28}	2^{27}	2^8	2^7	2^0
1	1	0	X	Network address		Host address	

Fixed

Appendix 5.5 FL-net (OPCN-2) sub-net mask

The sub-net mask of FL-net (OPCN-2) is fixed at 255.255.255.0. There is no need for users of FL-net (OPCN-2) to change this setting. This value is the same as segments for the Class C original network address section and host address segments.

Appendix 5.6 TCP/IP, UDP/IP communication protocol

TCP, UDP and IP are the main protocols used in Ethernet. IP is positioned in the network layer of the communication protocol and controls the flow of the communication data.
TCP and UDP are positioned in the transport layer and while both use the IP as the network layer, there are big differences in the service.
TCP provides reliable service that will not recognize the breaks in data for the upper layer.
On the other hand, since the UDP functions for transmitting the data cluster (data diagram) as is to the top layer from IP, there is no assurance whether or not the data reaches its destination. It leaves the confirmation of reception and resending of data processing to the top layer. UDP provides small overhead transmission service while it is less reliable in comparison to TCP.
FL-net (OPCN-2) uses UDP. This is because the process involved in confirming and resending of questionable TCP data is redundant in the FL-net (OPCN-2). This process is eliminated and instead, high speed data exchange is provided by dividing and composing multiple frames and control of transmission rights through the use of tokens in the top layer of FL-net (OPCN-2) protocol.

Appendix 5.7 FL-net (OPCN-2) port numbers

The following port number have been pre-determined for realizing service FL-net (OPCN-2) protocol positioned in the upper transport layer. There is no need for FL-net (OPCN-2) users to set the parameters for these port numbers.

	Name	Port number
1	Port number for cyclic transmission	55000 (Fixed)
2	Port number for message transmission	55001 (Fixed)
3	Port number for participation request frame	55002 (Fixed)
4	Port number for sending	55003 (Fixed)

Appendix 5.8 Data format for FL-net (OPCN-2)

(1) Summary of data format for FL-net (OPCN-2)
The data that is sent by FL-net (OPCN-2) is capsulated in layers of the communication protocol shown below.
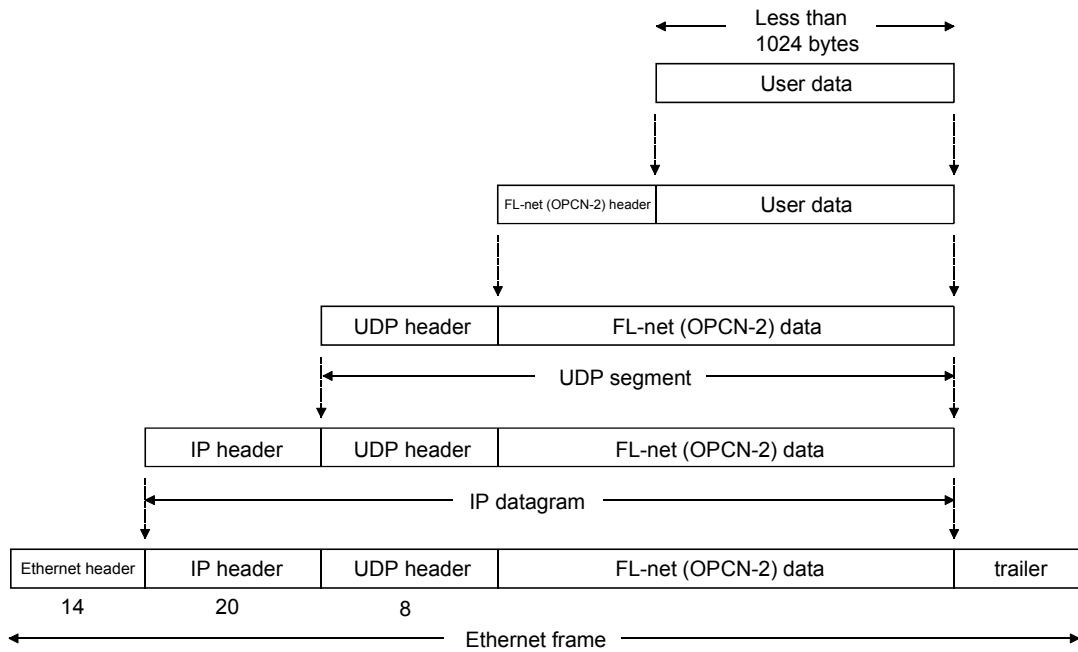
The following shows one frame of FL-net (OPCN-2) data that can be observed on a communication line.
As for example, cyclic data of 128 bytes are transferring.

| Ethernet header | IP header |
| UDP header | FL-net (OPCN-2) header |

ADDR	HEX	ASCII
0000	FF FF FF FF FF FF 08 00 19 10 00 07 08 00 45 00	. . . . E.
0010	00 E4 EB 59 00 00 80 11 D8 52 C0 A8 FA 0B C0 A8	. . . Y . . . . . R . . . . .
0020	FA FF D6 DB D6 D8 00 D0 00 00 46 41 43 4E 00 00	. . . . FACN. .
0030	00 C8 00 01 00 0B 00 01 00 01 00 07 07 00 00 00	. . . .
0040	00 00 01 00 00 00 08 00 00 00 00 00 00 00 0A 00	. . . .
0050	00 00 FD E8 00 00 00 28 00 04 02 80 00 40 00 00	. . . . (. . . . . @. .
0060	80 00 01 01 00 C8 61 32 00 02 5B 91 00 00 00 00	. . . . . . a2. . [. . . . .
0070	00 00 5B 91 00 00 00 00 00 00 00 00 00 00 00 00	. . [. . . . .
0080	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . .
0090	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . .
00A0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . .
00B0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . .
00C0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . .
00D0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . .
00E0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . .
00F0	00 00	. .

| User data |

(2) FL-net (OPCN-2) header format
FL-net (OPCN-2) headers can be from 64 to 96 bytes in size. Note that under
FL-net (OPCN-2) protocol, FL-net (OPCN-2) headers are attached to the first
address of all frames.

```
          |← 64 to 96byte →|←        Less than 1024byte        →|

          | FL-net (OPCN-2) |                                    |
          | header          |        Cyclic/Message data         |

| Lower layer header |                  FA link data                  |

|←                      Less than 1500byte                      →|
```
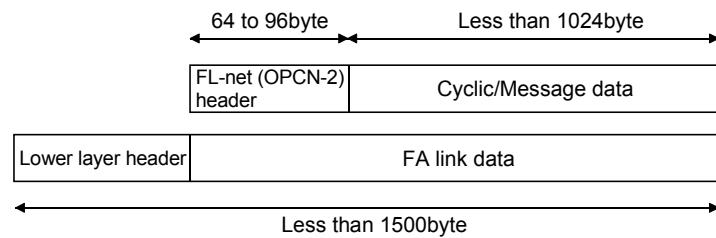
Appendix 5.9 FL-net (OPCN-2) transaction code

Refer to Section 6.2.8.(3), (4) for details.

Appendix 6 FL-net (OPCN-2) Network Control

Appendix 6.1 FL-net (OPCN-2) token control

(1) Token

Nodes can transmit only when the nodes are holding a token. Under following two conditions, the nodes can transmit; token reissuing due to expiration of token monitoring time and participation request while node is not in the network.

(a) In the FL-net (OPCN-2), a single token is circulated among nodes.

(b) Each node holds a transmission right to the network as long as the node has a token after receiving it.

(c) The token is circulated among all the nodes participating in the FL-net (OPCN-2)

(d) The token can be transmitted together with cyclic data.

(e) The token can also be circulated without any data.

(f) The token is monitored by the timer of each node. If the token is not sent in the network for specified time, another token will be reissued automatically.

(g) If there are two tokens in the network, they are unified into one.

(2) Token flow
Basically, there is only one token for the network. When there are two or more tokens, the smallest address node number has priority while others are eliminated.

The frame that includes the token (token frame) has a token address node number and a token dispatch node number. When the node matches the token address node number of the token frame received, it becomes the token holding node.

The sequence of the token rotation is determined by the node number. Rotation is performed in ascending order among the nodes that are registered in the joining node control table. The highest node number passes the token to the lowest node number.
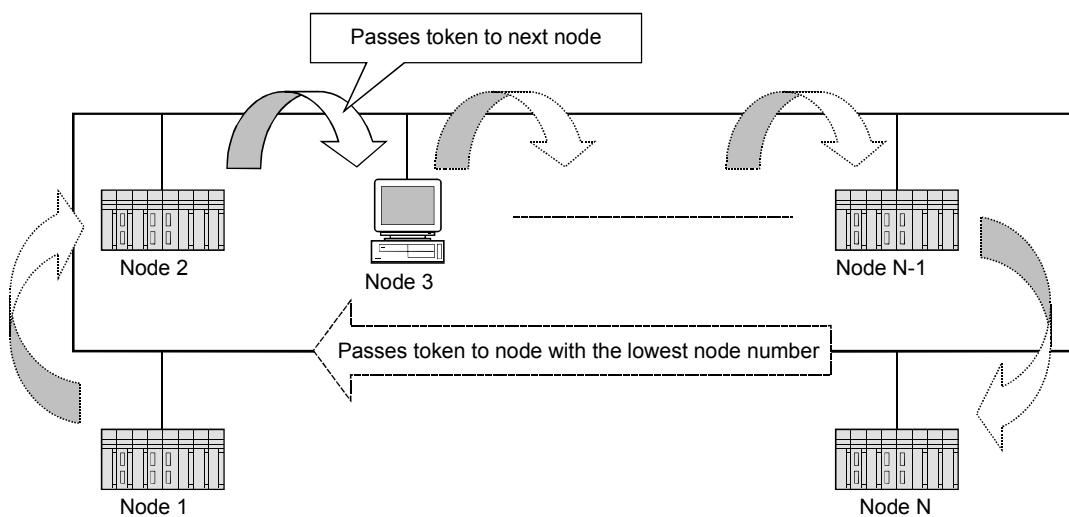
(3) Token and data

There are the following 6 types of patterns for the data when sending a token.

(a) For the QJ71FL71-T-F01, QJ71FL71-B5-F01, and QJ71FL71-B2-F01

No.	Item	Contents
1	When there is no accompanying data	Only the token is sent.
	Token ⟩	
2	When there is only cyclic data	The token is sent after the cyclic data has been sent.
	Token Cyclic data ⟩	
3	When there is only cyclic data and the cyclic data is divided and sent	The token is sent after the cyclic data has been divided and sent.
	Token Cyclic data Cyclic data ⟩	
4	When there is only message data	The token is sent after the message data has been sent.
	Token Message data ⟩	
5	When there is cyclic data and message data	The cyclic data and token is sent after the message data has been sent.
	Token Cyclic data Message data ⟩	
6	When there is cyclic data and message data and the cyclic data is divided and sent	The message data is sent first, then the cyclic data is divided and sent, and the token is sent last.
	Token Cyclic data Cyclic data Message data ⟩	
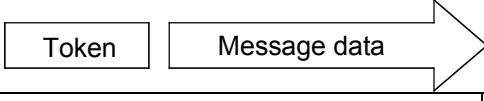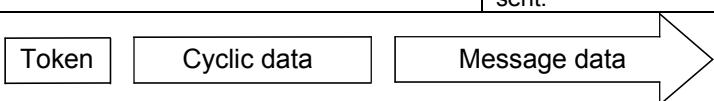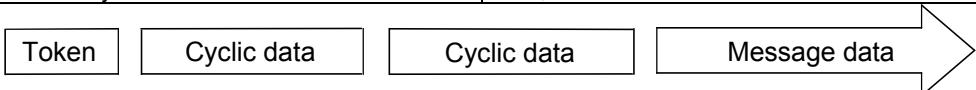
(b)　For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2

No.	Item	Contents
1	When there is no accompanying data	Only the token is sent.
	Token	
2	When there is only cyclic data	The token is sent after the cyclic data has been sent.
	Token + cyclic data	
3	When there is only cyclic data and the cyclic data is divided and sent	Only the cyclic data is sent and the token is attached to the last frame and send.
	Token + cyclic data　　Cyclic data	
4	When there is only message data	The token is sent after the message data has been sent.
	Token　　Message data	
5	When there is cyclic data and message data	After the message data has been sent, the token is attached to the cyclic data and sent.
	Token + cyclic data　　Message data	
6	When there is cyclic data and message data and the cyclic data is divided and sent	After the message data has been sent, only the cyclic data is sent and the token is attached to the last frame and sent.
	Token + cyclic data　　Cyclic data　　Message data	
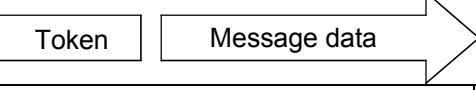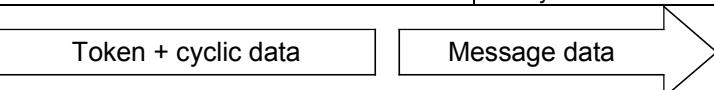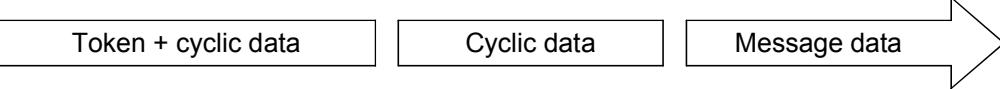
(4)　Frame interval (Minimum permissible frame interval)

The frame interval is time from when a local node receives the token until it dispatches a frame. The minimum permissible frame interval is the shortest amount of time a node has to wait before dispatching a frame.

With FL-net (OPCN-2), this minimum permissible frame interval is shared by the network. Each node recalculates and updates the largest value for the minimum permissible frame interval when nodes join or leave.

(5) Refresh cycle time

As shown below, the refresh cycle time is the time from when a local node dispatches a token until it is held.

(a) For the QJ71FL71-T-F01, QJ71FL71-B5-F01, and QJ71FL71-B2-F01

    1) Refresh cycle time (RC)

       • At 100Mbps

       RC [ms] = The number of nodes $\times$ 1.3 + total number of cyclic data words ($*$1) $\times$ 0.0022 + (total number of frames ($*$2) – the number of nodes) $\times$ the minimum frame interval time setting value ($*$3) / 10 + (number of separating nodes $\times$ token monitoring time ($*$4)) • • • Add to separation time

       + (1.3 + number of message data words $\times$ 0.0011) • • • Add to message transmission time

       • At 10Mbps

       RC [ms] = The number of nodes $\times$ 1.7 + total number of cyclic data words ($*$1) $\times$ 0.0032 + (total number of frames ($*$2) – the number of nodes) $\times$ the minimum frame interval time setting value ($*$3) / 10 + (number of releasing nodes $\times$ token monitoring time ($*$4)) • • • Add to release time

       + (1.7 + number of message data words $\times$ 0.0016) • • • add to message transmission time

$*$1 : Total number of data words	· · · ·	Total of area 1 (bit area) and area 2 (word area) that have been assigned to each node.
$*$2 : Total number of frames	· · · ·	The total number of frames that have been divided when the size for each node has exceeded 1024 bytes.
$*$3 : Minimum frame interval time setting value	· · · ·	Maximum setting value for all nodes.
$*$4 : Token monitoring time	· · · ·	The token monitoring time that has been set for each node.

2) Token hold time
• At 100Mbps
Token holding time [ms] = 1.3 + (number of local node transmission cyclic data word $\times$ 0.0022) + {(number of frames - 1) $\times$ minimum frame interval time setting value/10}

• At 10Mbps
Token holding time [ms] = 1.7 + (number of local node transmission cyclic data word $\times$ 0.0032) + {(number of frames - 1) $\times$ minimum frame interval time setting value/10}
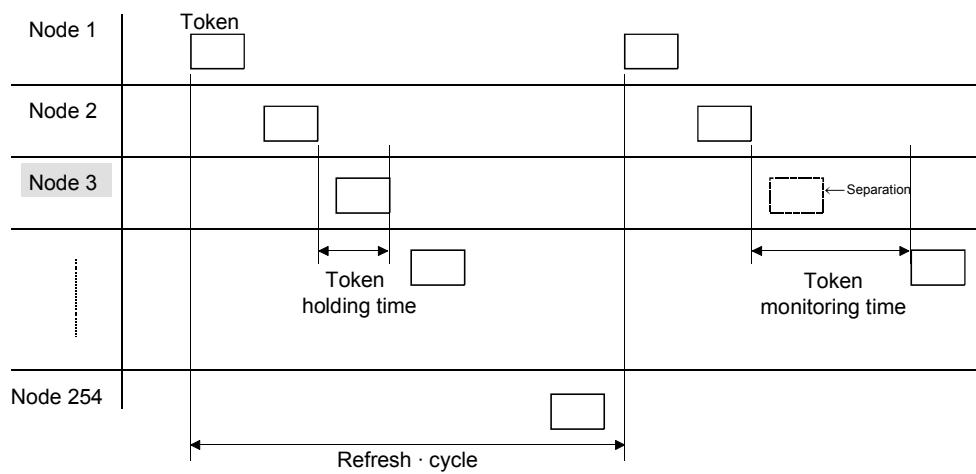
POINT

(1) The above are the calculations when comprised of this module and will become the sum total of token holding time when mixed with equipment from other manufacturers.

(2) When the minimum frame interval time is larger than the token holding time, the following will apply: RC [ms] = total number of frames $\times$ minimum frame interval time setting value/10.

(3) Separation is determined as follows. When each node receives a token frame, it checks the node number. If a token frame is not received from a given node for three times continuously, it is considered separated. Note that this also includes when a node holding a token does not dispatch a token even though the token monitoring time has been exceeded.

(b) For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2
  1) Refresh cycle time (RC)
  RC [ms] = Total number of nodes×1.35 + total number of cyclic data words (∗1) ×0.0032 + (total number of frames (∗2) – the number of nodes) × the minimum frame interval time setting value (∗3)10 + (number of separating nodes × token monitoring time (∗4))・・・Add to separation time
  + (1.35 + number of message data words×0.0016)・・・add to message transmission time

∗1 : Total number of data words	・・・ Total of area 1 (bit area) and area 2 (word area) that have been allocated to each node.
∗2 : Total number of frames	・・・ The total number of frames that have been divided when the size for each node has exceeded 1024 bytes.
∗3 : Minimum frame interval time setting value	・・・ Maximum setting value for all nodes.
∗4 : Token monitoring time	・・・ The token monitoring time that has been set for each node.

  2) Token hold time
  Token hold time [ms] = 1.35 + (number of local node transmission cyclic data word × 0.0032) + {(number of frames - 1) × minimum frame interval time setting value/10}
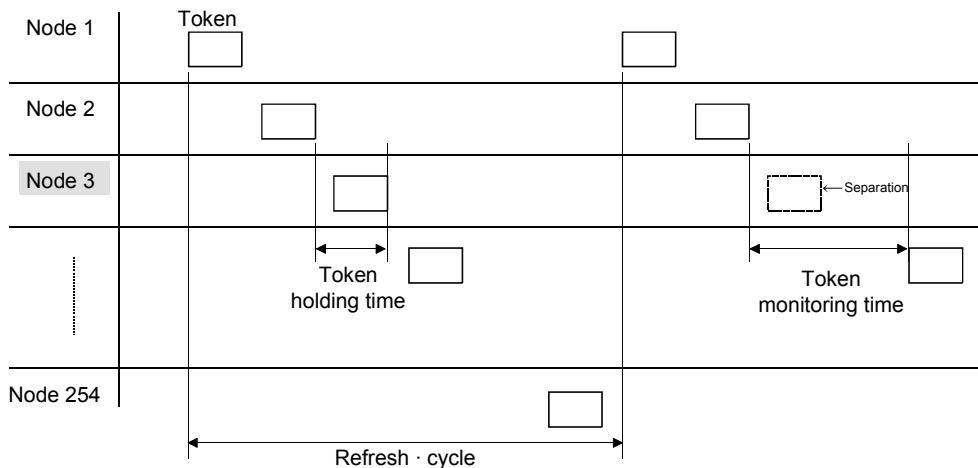
POINT
(1) The above are the calculations when comprised of this module and will become the sum total of token hold time when mixed with equipment from other manufacturers.
(2) When the minimum frame interval time is larger than the token hold time, the following will apply: RC [ms] = total number of frames × minimum frame interval time setting value/10.
(3) Separation is determined as follows. When each node receives a token frame, it checks the node number. If a token frame is not received from a given node for three times continuously, it is considered separated. Note that this also includes when a node holding a token does not dispatch a token even though the token monitoring time has been exceeded.

(6) Refresh time

The transmission time between the cyclic data area and device area.

(a) Automatic refresh

Refresh time
= Refresh time of the first setting item
+ Refresh time of the second setting item
+····+ Refresh time of the "n"th setting item

─── First setting item
─── Second setting item
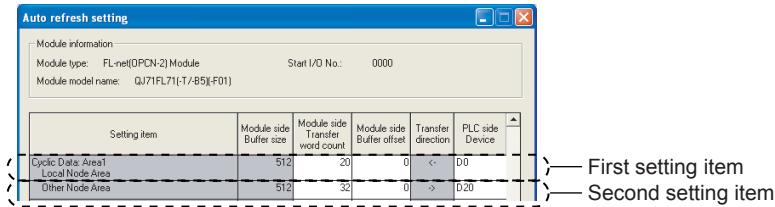
Refresh time for a setting item

1) When Module side Transfer word count for a setting item is set to 16 or larger

Refresh time for a setting item
$= \{KN1 + KN2 \times (\text{Module side transfer word count 1}[1])\}$
$+ \{KN3[3] + KN4 \times (\text{Module side transfer word count 2}[2])\}$ [ms]

[1] Apply multiples of 16 for Module side transfer word count 1 in the equation.

Example: If Module side Transfer word count is set to 20, apply 16 for Module side transfer word count 1 in the equation.

For Q00J/Q00/Q01/Q02CPU, apply multiples of 4.

[2] Apply the remainder when Module side Transfer word count is divided by 16 for Module side transfer word count 2 in the equation.

Example: If Module side Transfer word count is set to 20, apply 4 for Module side transfer word count 2 in the equation.

For Q00J/Q00/Q01/Q02CPU, apply the remainder when Module side Transfer word count is divided by 4.

[3] When Module side transfer word count 2 is 0, apply 0 for KN3 in the equation.

2) When Module side Transfer word count for a setting item is set to smaller than 16

Refresh time for a setting item
$= KN3 + KN4 \times (\text{Module side Transfer word count})$ [ms]

Constant KN1 to KN4 in the equation

1) When the FL-net module is mounted on the main base unit

CPU module		KN1	KN2	KN3	KN4
Basic model QCPU	Q00JCPU	0.168ms	0.0008ms	0.115ms	0.055ms
	Q00CPU	0.134ms	0.0008ms	0.091ms	0.046ms
	Q01CPU	0.128ms	0.0007ms	0.085ms	0.041ms
High Performance model QCPU	Q02CPU	0.043ms	0.0004ms	0.053ms	0.013ms
	Other than above	0.017ms	0.0003ms	0.027ms	0.006ms
Process CPU					
Redundant CPU					
Universal model QCPU	Q00UJ/Q00U/Q01UCPU	0.096ms	0.0006ms	0.046ms	0.008ms
	Q02UCPU	0.096ms	0.0006ms	0.023ms	0.006ms
	Q03UD/Q03UDECPU	0.043ms	0.0005ms	0.006ms	0.005ms
	Other than above	0.035ms	0.0004ms	0.004ms	0.005ms

2) When the FL-net module is mounted on the extension base unit

CPU module		KN1	KN2	KN3	KN4
Basic model QCPU	Q00JCPU	0.181ms	0.0015ms	0.120ms	0.056ms
	Q00CPU	0.157ms	0.0015ms	0.092ms	0.048ms
	Q01CPU	0.145ms	0.0014ms	0.086ms	0.043ms
High Performance model QCPU	Q02CPU	0.045ms	0.0009ms	0.061ms	0.015ms
	Other than above	0.016ms	0.0008ms	0.029ms	0.008ms
Process CPU					
Redundant CPU					
Universal model QCPU	Q00UJ/Q00U/Q01UCPU	0.104ms	0.001ms	0.086ms	0.009ms
	Q02UCPU	0.104ms	0.001ms	0.045ms	0.007ms
	Q03UD/Q03UDECPU	0.047ms	0.001ms	0.007ms	0.006ms
	Other than above	0.037ms	0.001ms	0.005ms	0.006ms

Calculation example

The following is the calculation example when the FL-net module is mounted on the main base unit for the Q26UDHCPU and auto refresh setting is set as shown below.

First, Module side Transfer word count: 20
Second, Module side Transfer word count: 32
Third, Module side Transfer word count: 4
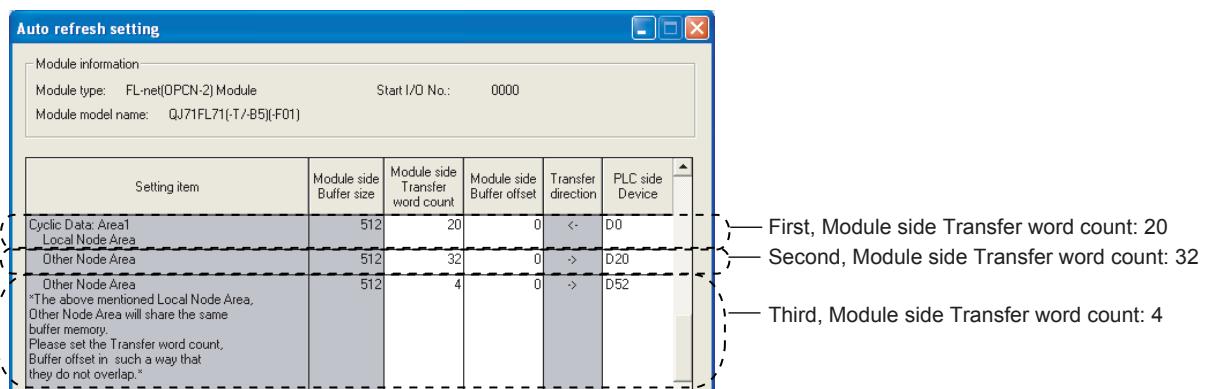
Auto refresh time for the FL-net module

= Refresh time of the first setting item + Refresh time of the second setting item + Refresh time of the third setting item

= {KN1 + KN2 × (Module side transfer word count 1)} + {KN3 + KN4 × (Module side transfer word count 2)}   ←First

  + {KN1 + KN2 × (Module side transfer word count 1)} + {KN3 + KN4 × (Module side transfer word count 2)}   ←Second

  + KN3 + KN4 × (Module side Transfer word count)   ←Third

= {0.035 + 0.0004 × 16} + {0.004 + 0.005 × 4} + {0.035 + 0.0004 × 32} + {0} + {0.004 + 0.005 × 4}

= 0.1372ms

= 138μS

(b) During BMOV (FROM/TO)

CPU module		1 point	1000 points
Basic model QCPU	Q00JCPU	0.120ms	0.734ms
	Q00CPU	0.101ms	0.677ms
	Q01CPU	0.0917ms	0.642ms
High Performance model QCPU	Q02CPU	0.048ms	0.489ms
	Other than above	0.025ms	0.448ms
Process CPU			
Redundant CPU			
Universal model QCPU	Q00UJ/Q00U/Q01UCPU	0.075ms	0.499ms
	Q02UCPU	0.037ms	0.539ms
	Q03UD/Q03UDE CPU	0.017ms	0.498ms
	Other than above	0.017ms	0.494ms

(7) Transmission delay time

The transmission delay time indicates the delay time until the cyclic data is transmitted from the node.

(a) Minimum transmission delay time [ms] = SM1(∗5) + token holding time + SM2 (∗6)

(b) Maximum transmission delay time [ms] = SM1 (∗5) + (refresh cycle time (RC) × 4) + SM2 (∗6)

  ∗5: SM1 · · · · Send side sequence scan (including refresh time)

  ∗6: SM2 · · · · Receive side sequence scan (including refresh time)

1) When refresh cycle > sequence scan
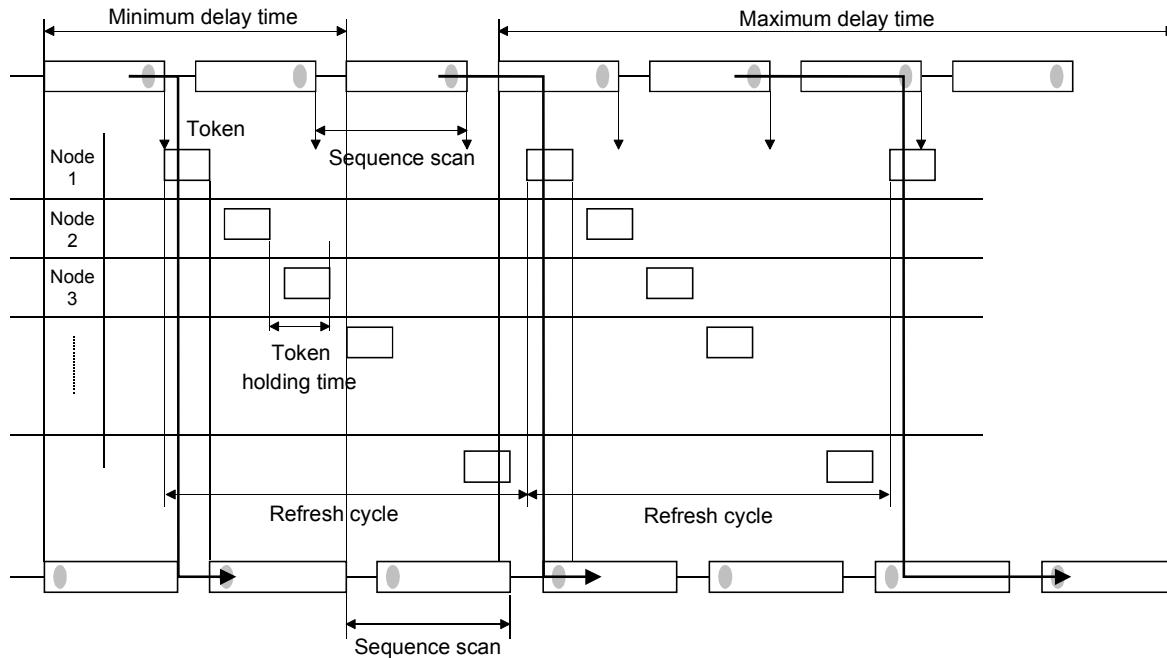
2) When refresh cycle < sequence scan
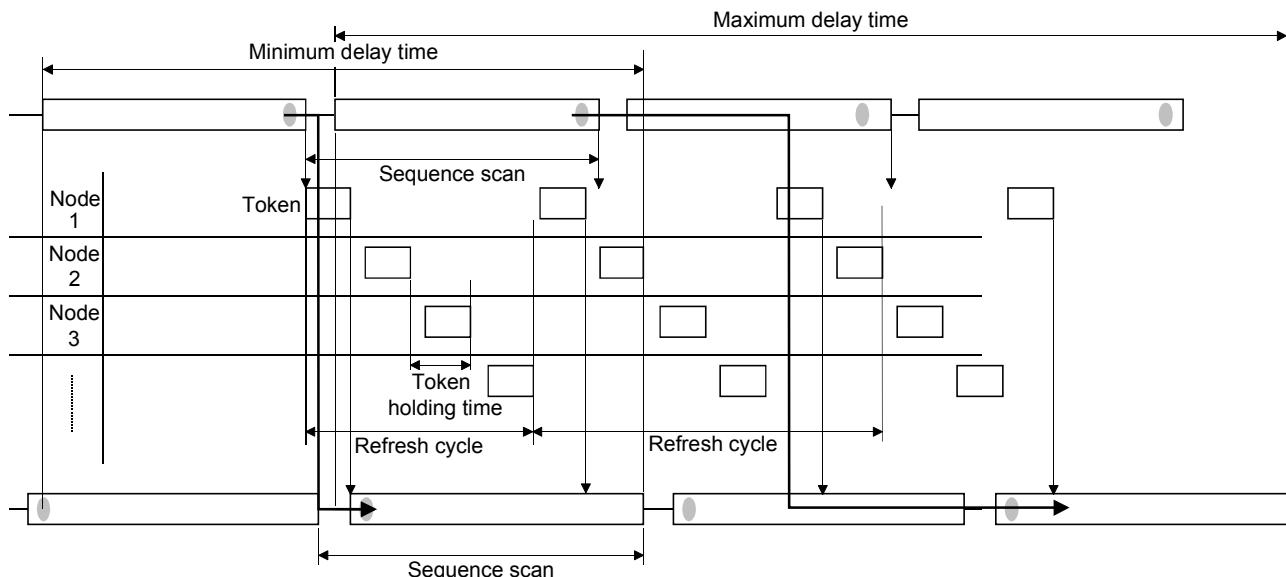
POINT

Due to the relationship between the refresh cycle time and sequence scan time, there is a need to also estimate the transmission delay time with the maximum delay time for "when refresh cycle time < the sequence scan".

Appendix 6.2 FL-net (OPCN-2) enter and release

    (1) Subscription to FL-net (OPCN-2)

During start-up, each node monitors the transmission line until each of the token detection times have expired. If the node has not received a token at that time, it determines that the network is starting up and makes a new participation joining with the network. Or, if the node has received the token, it determines that it is in joining mode and performs in-process participating with the network.

      (a) New participation

If the token has not been received after the token detection time (＊1) has expired, preparations are made for sending a trigger, which is sent approximately (node number/8) $\times$ 4 ms later. If a trigger is received before one is sent, the trigger is not sent.

During the participation request frame receive wait time (1200 ms) from when the trigger was received, all nodes wait for sending a participation request frame while checking for duplicate node numbers and addresses and updating join node control tables. After the participation request frame receive wait time (＊3) (node number $\times$ 4 ms) from when the trigger was received has expired, the participation request frame is sent. At this time, nodes that recognized duplicate addresses by the participation request frame of other nodes set area 1 (bit area) and area 2 (word area) of the first address of the common memory and the common memory size to zero (0) and do not send cyclic data.

The nodes that recognized duplicate addresses set the duplicate address flag and reset the common memory data validity notification flag. At the time the participation request frame receive wait time has ended, the node with the smallest node number sends the first token in accordance with the join node control table. All the nodes that recognized node number duplication do not send or receive.
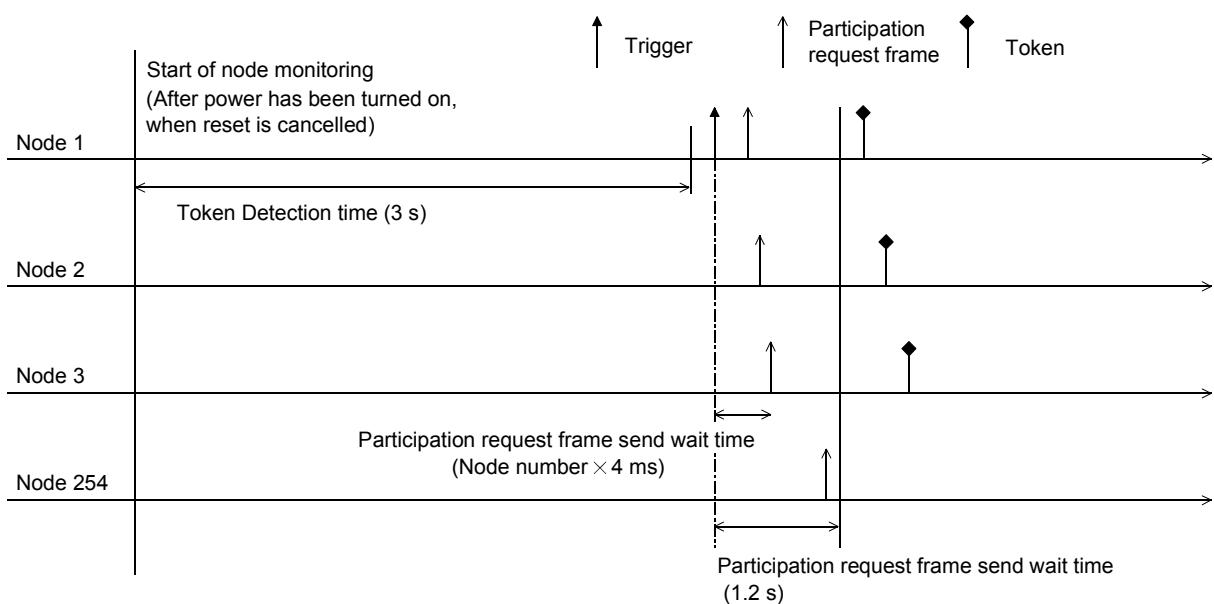
(b) Participating (halfway participation)

When a token is received within the token detection time (＊1) and a previously established link is recognized, there is a wait in the sending of the participation request frame until the token has completed three cycles. (＊2) During this time, the frame that has been received is used for checking for duplicate addresses and updating the join node control table. At this time, nodes that recognized duplicate addresses set area 1 (bit area) and area 2 (word area) of the first address of the common memory and the common memory size to zero (0) and do not send cyclic data. The nodes that recognized duplicate addresses set the address multiplexing flag and reset the common memory data validity notification flag.

If there is no error with a node number, the node sends the participation request frame after the participation request frame send wait time has expired. (＊3) The participation request frame is sent without any relation to the holding of the token.

The nodes that recognized duplicate node numbers do not send participation request frames and do not participate in the network.

＊1 : Subscription token detection time	· · · ·	Time for checking if the network is in operation mode.
＊2 : Cycle	· · · ·	The standard for a cycle is based on the time at which the token addressed to the smallest node number is received.
＊3 : Participation request frame send wait time	· · · ·	The dispatching of a participation request node is sent after the (node number $\times$ 4 ms) has passed so that it does not overlap with another node that is newly participating.
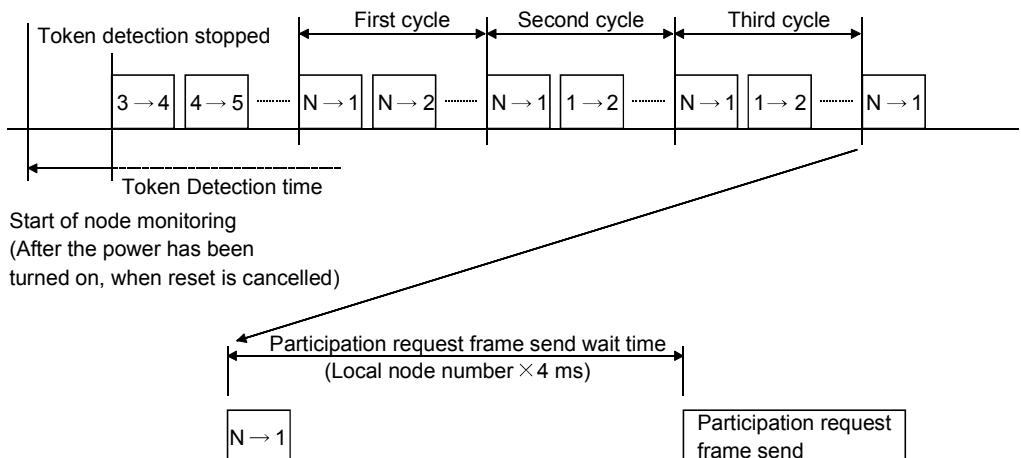
(2) Release from FL-net (OPCN-2)

When each node receives a token frame, it checks the node number. If a token frame is not received from a given node for three cycles continuously, it is considered released. (Note that this also includes when a node holding a token does not dispatch a token even though the token monitoring time has been exceeded.) When a node is determined to have released from the network as shown above, the data for that node is deleted from the control table.

Appendix 7 Network Components

Appendix 7.1 List of Ethernet components

The following shows the components to configure Ethernet. Use the network equipment conforming to the IEEE802.3 standard.
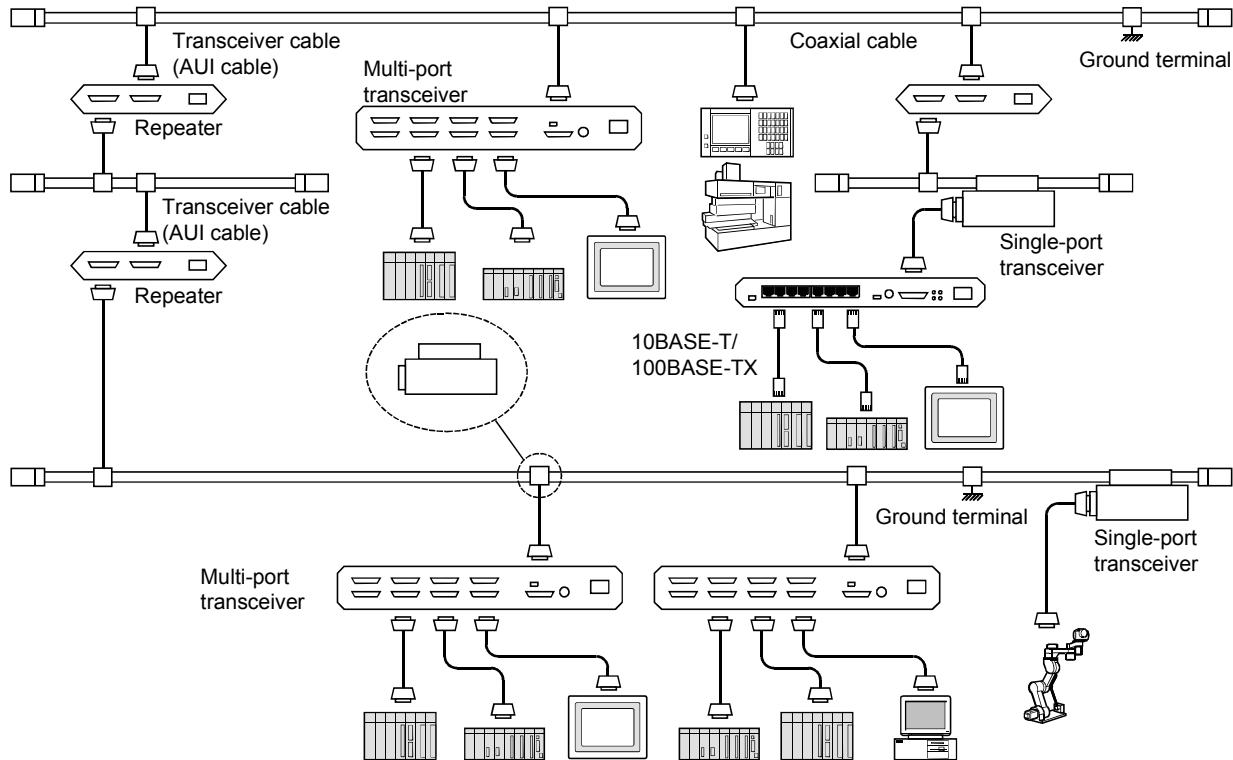
Appendix 7.2 10BASE5 components

(1) Transceiver
The transceiver is the device that converts the signals flowing through the coaxial cable (yellow cable) into the signals the node requires or vice versa.
When connecting a transceiver to a coaxial cable, there is a need to set them at an integral multiple of 2.5 m. Connection is done by following the inscription (jacket mark) on the coaxial cable and installing.
Always turn off the power supply for the node and transceiver when connecting the transceiver to the coaxial cable. Making the connection while the power is on will cause shorting.

Secure with bands (Approx. 2 locations)

Transceiver cable

Coaxial cable

Transceiver (tap type)
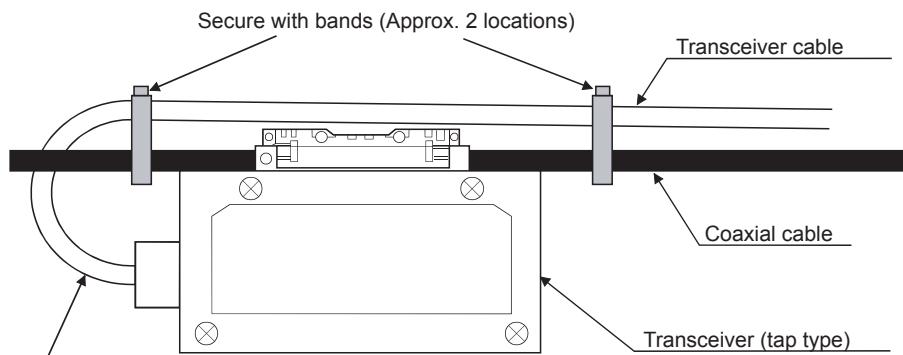
Take the bending radius of the transceiver cable into consideration (the smallest bending radius is 80 mm)

Transceiver cable (AUI cable)

Travel TR

Retainer

Coaxial cable (yellow cable)

Transceiver (tap type)

M6 bolt 141

Tap connector
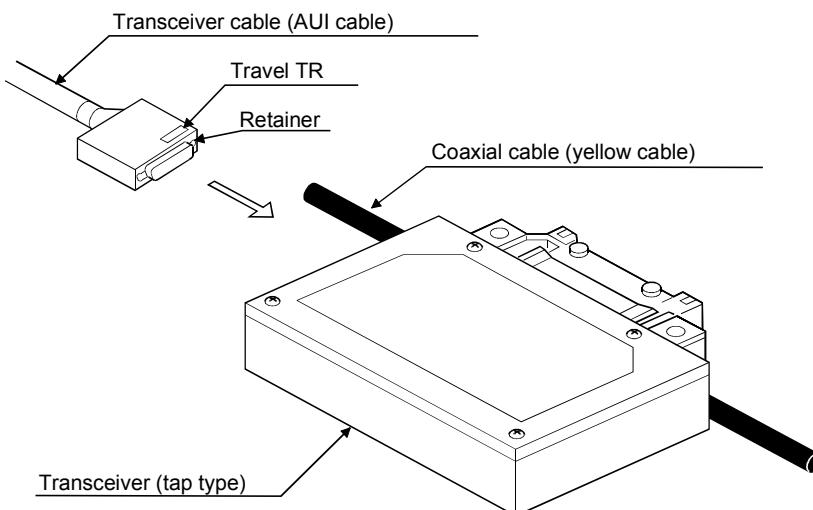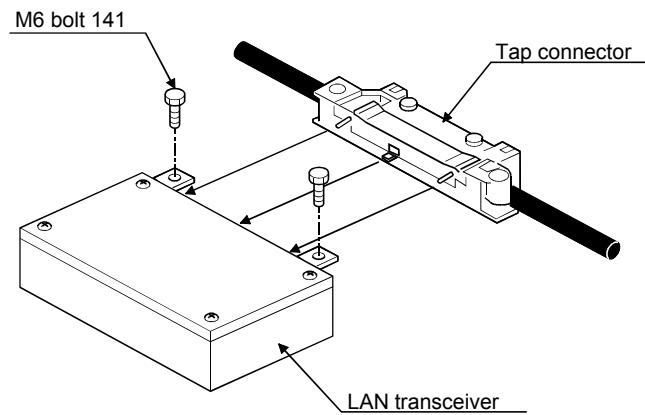
LAN transceiver

(a) Transceiver (tap type)

To connect a tap-type transceiver, make a hole in the coaxial cable and push in the pin for contacting the center conductor while breaking the insulation jacket on the shielded conductor with the tooth-like tab. Note that special tools are required to connect.

The transceiver power supply (12 V DC) is supplied from the node via the transceiver cable. Note that some nodes may require 12 V DC power supply when using a transceiver cable. Check the hardware manual for the node for details.

The following are the most common settings for the SQE switch.

1) When connected to node   : ON

2) When connected to repeater: OFF

Coaxial cable

Transceiver

SQE

ON   OFF

Transceiver cable
(AUI cable)

AUI connector
D-sub 15 pin

12 V DC
external
power supply

Example of AUI
external power
supply input terminal
12 V DC (depends on type)
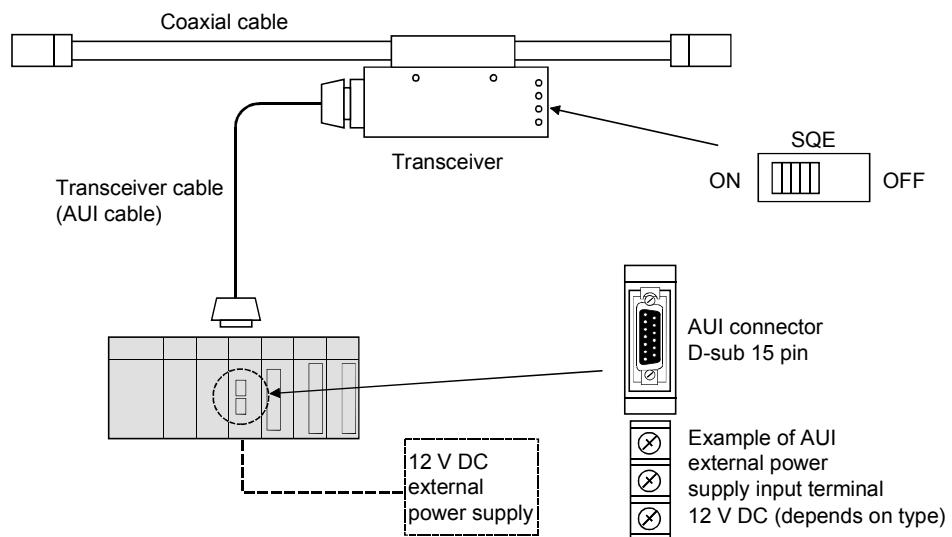
(b) Transceiver (Connector type)
With the connector type transceiver connection, a connector is attached to
the coaxial cable and it is connected to the connector on the transceiver.
No special tools are required for installation and the connection can be
easily removed. Supply power to the transceiver from nodes via
transceiver cable.
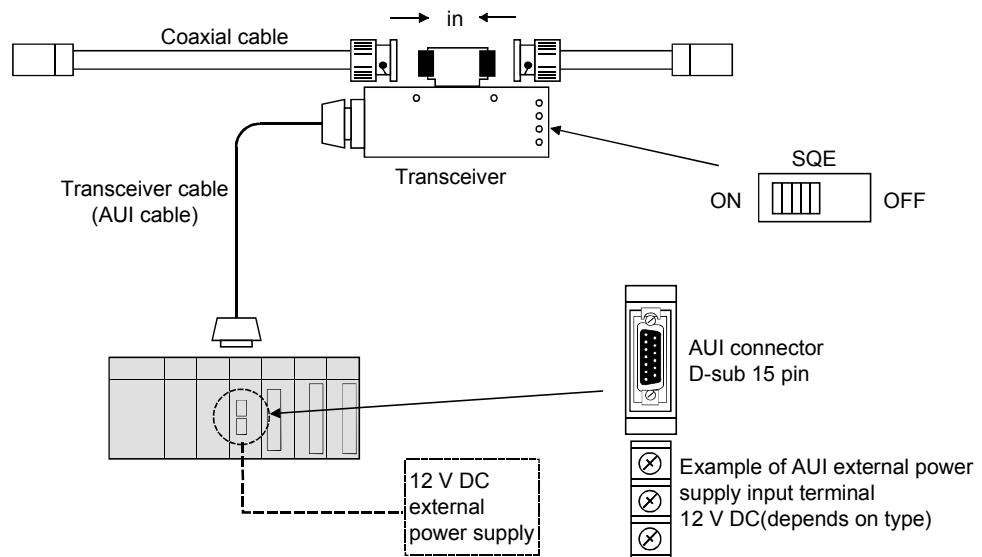
(c) Multi-port transceiver
A multi-port transceiver allows terminals to be connected to the tap type
transceiver and the connector type transceiver, which normally would only
be capable of having one terminal connected to them. 4-port and 8-port
transceivers are the most common. Supply power to the transceiver by
connecting the power supply cable.
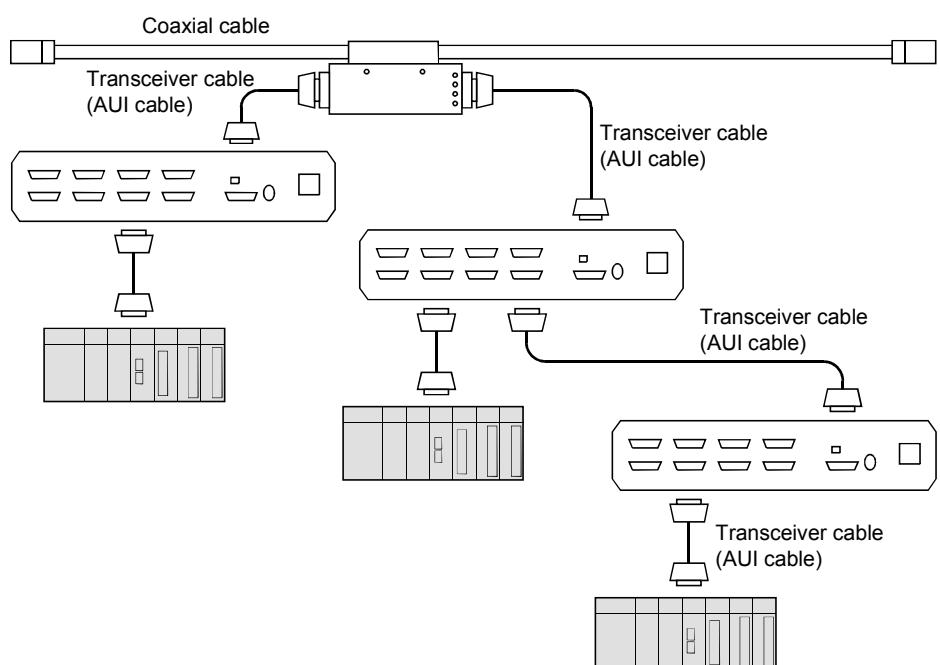
(d) Repeater

A repeater is a device that relays the transmission signal once again. It is used for interconnecting segments that have different media, extending the length of a media segment, increasing the number of terminals connected and converting cable media. A repeater receives the signal from one of the interconnected segments, adjusts the waveform, amplifies it to a predetermined level and sends (or repeats) it to the other segment connected to the repeater.

While it is possible to connect a transceiver cable of up to 50 m to the repeater, it is recommended that the length be less than 2 m due to electrical noise and other factors. Check that the SQE switch is off when connecting to the repeater.
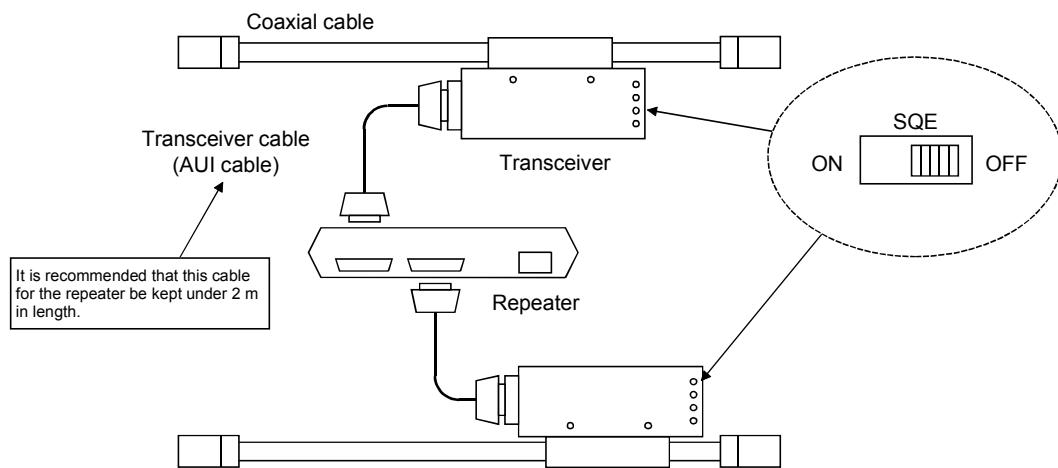
(2) Coaxial cable

The coaxial cable is constructed of an inner conductor and an outer conductor that serves as a shield. Coaxial cable used for Ethernet connection has a 50 ohm impedance and there are coaxial cables (yellow cables) for 10BASE2 RG58A/U and 10BASE5.

The 10BASE2 cable has a maximum length of 185 m and the 10BASE5 cable has a maximum length of 500 m. Always ground a coaxial cable to prevent electrical noise. This should be a one-point Type D ground.
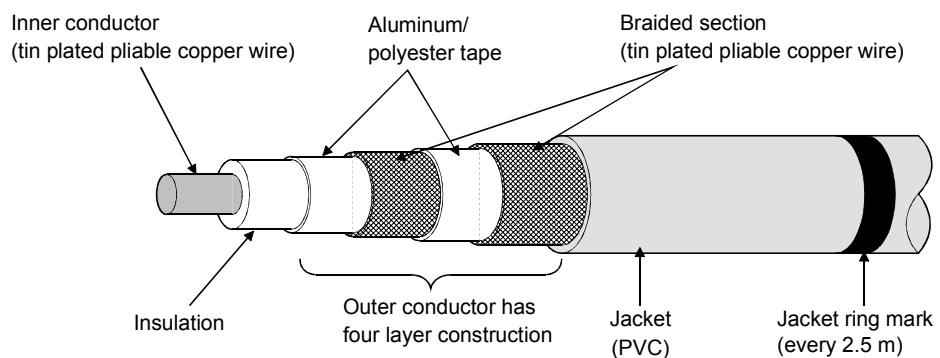
(3) Coaxial cable connector
Coaxial cable connector is commonly called N-type connector. It is the connector used to connect a coaxial cable to a terminator or to connect a coaxial cable to a connector type transceiver.
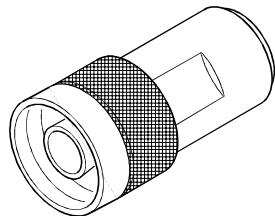
(4) Relay connector
This is the connector used for extending coaxial cable segments. A repeater is used to extend segments while the relay connector is used to extend the cable for the same segment.
Note that if multiple relay connectors are used, they could change the electrical resistance of the coaxial cable. (The use of relay connectors is not recommended.)
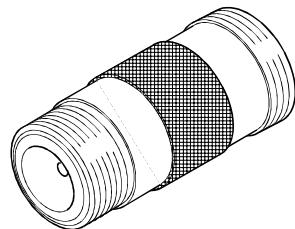
(5) Terminator (Terminal resistor)
Terminators must be connected to devices at both ends of a cable when a bus type configuration is used in order to prevent the signal from being reflected. If the connection at the terminator is not made, the signal is reflected (collides) and shuts the network down. There are two types of terminator, J-type for a tap type transceiver and P-type for a connector type transceiver. Connect terminators at the location indicated by the jacket mark on the coaxial cable.
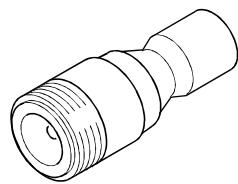
(6) Coaxial cable ground terminal

The coaxial cable ground terminal is a device that prevents transmission data errors due to electrical noise on coaxial cable. Always ground one point of the coaxial cable using a Type D ground.
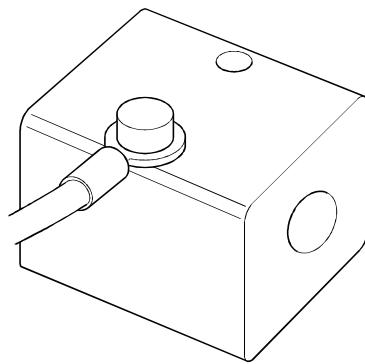
(7) Transceiver cable

Transceiver cable is used to connect the transceiver and node. Both ends of the transceiver cable have D-sub 15 pin AUI connectors. A transceiver cable can be up to 50 m long but it is recommended that the length be kept under 15 m in FA applications to reduce the potential for electrical noise. When using a transceiver with a ground terminal, connect it to the ground.

Node side   Ground terminal   Transceiver side
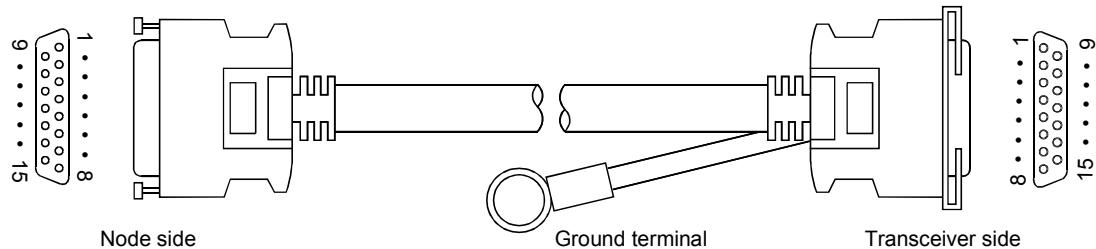
(8) 10BASE5/T converter
This is the converter for connecting a cable with a 10BASE5 interface to a 10BASE-T.

10BASE-T connector
(Female)   LED   10BASE5 connector
(Male)

Coaxial cable

Transceiver cable
(AUI cable)   Transceiver

HUB
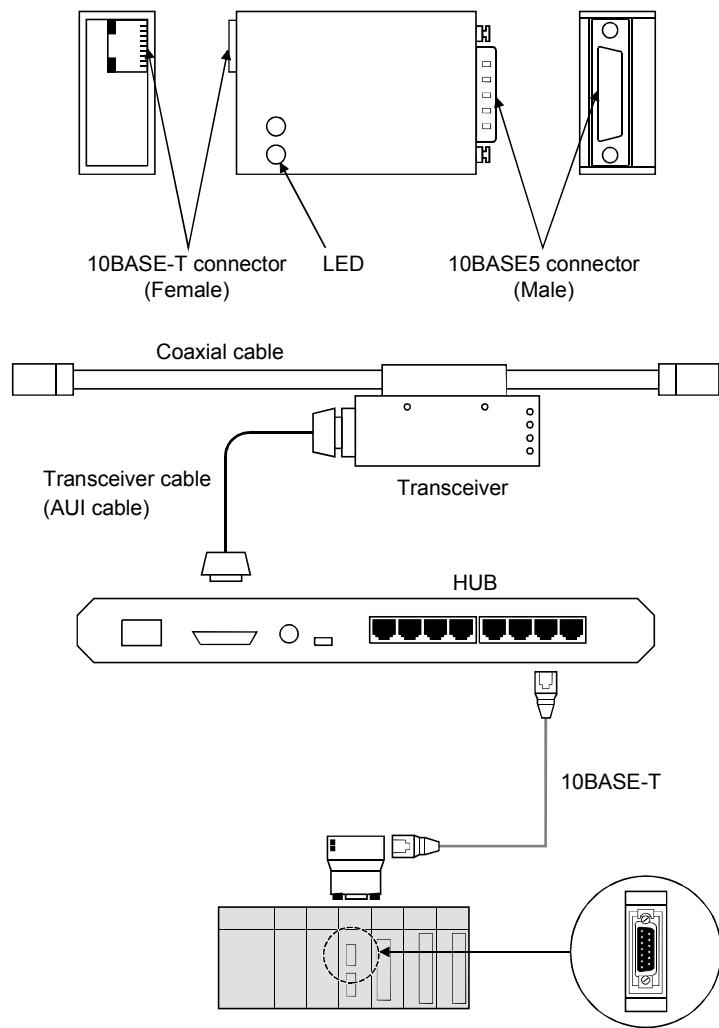
10BASE-T

(9) Coaxial cable/optical media converter repeater
Coaxial cable/optical media converter repeater is a device that converts electrical signals on coaxial cable (10BASE5, 10BASE2) to optical signals. Various types include the fiber optic inter repeater link (FOIRL) for connecting repeater segments and 10BASE-FL for connecting to a terminal. Coaxial cable/optical media converter repeater is used for preventing electrical noise, extending cable length and other applications.
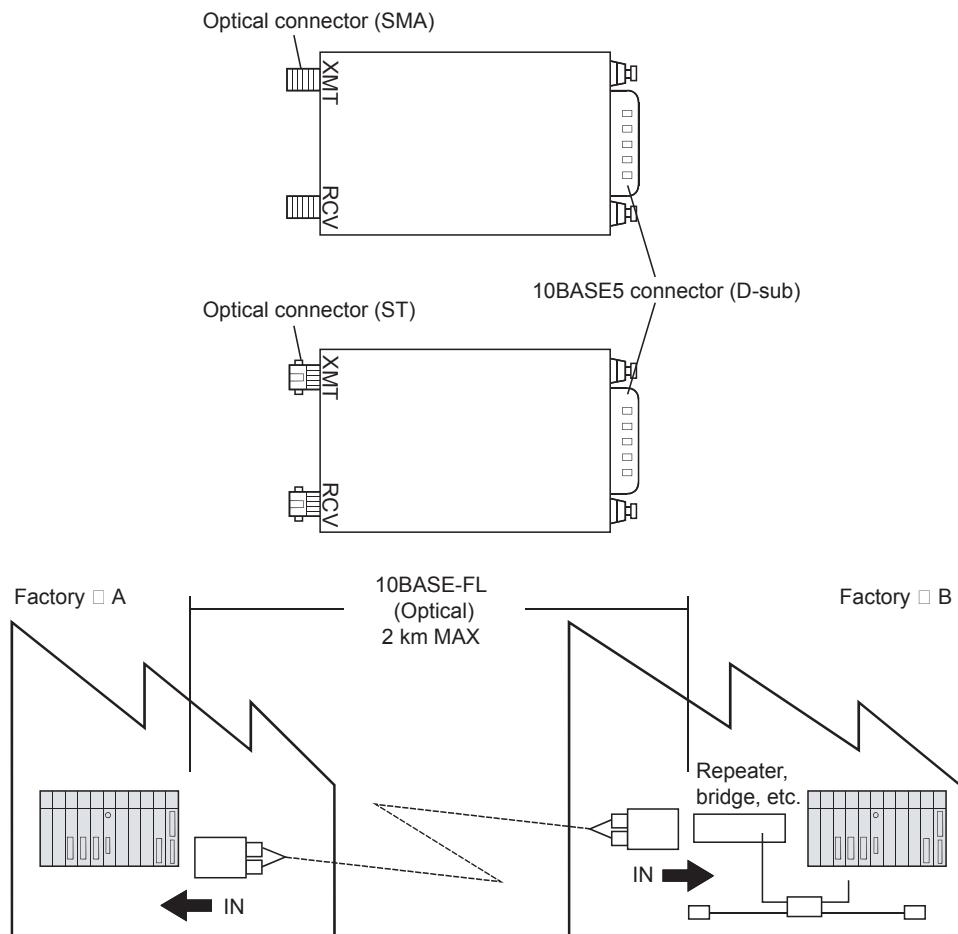
Appendix 7.3 10BASE-T/100BASE-TX components

(1) Hub
Hub is a centralized wiring device with repeater functions capable of
accommodating twisted pair cable used by 10BASE-T/100BASE-TX.
There are hubs with 10BASE2 interfaces, cascade type (multi-level connections)
interfaces and others.
When a repeater hub is used, up to four hubs (up to two hubs for 100BASE-TX)
can be used for cascading. *1
There are also stackable hubs that allow several hubs to be used as one.

*1 For the number of hubs that can be used when a switching hub is used,
   consult the manufacturer of the switching hub.
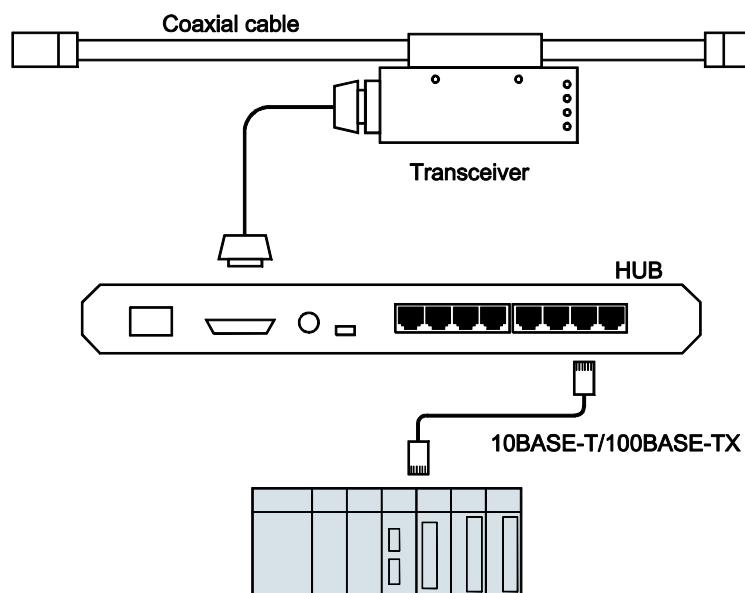
(2) 10BASE-T/100BASE-TX cable
This is a twisted pair cable in which the copper wires are matched into pairs, twisted and covered by a protective outer cover. The following are some of the types available.

(a) Shielded STP cable and unshielded UTP cable

(b) Cross cable used for making connections directly between nodes and straight cable used for connections through a HUB

Maximum transmission speed in a 10BASE-T/100BASE-TX cable is 10 Mbps/100 Mbps and it can be up to 100 m long. Both ends of the cable have the 8-point modular connector specified by ISO8877.
Arrange so that Category 5 compliant components are used on 10BASE-T/100BASE-TX cable.
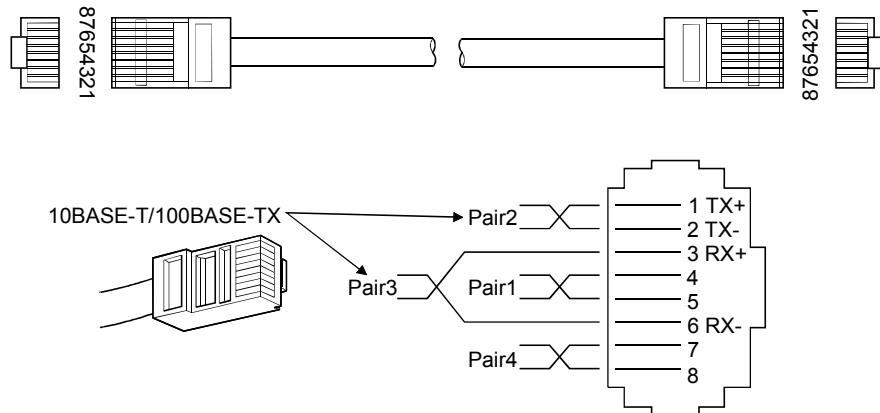
(3) 10BASE-T /optical media converter repeater
10BASE-T /optical media converter repeater is a device that converts electrical signals on 10BASE-T cable to optical signals. There are fiber optic inter repeater link (FOIRL) for connecting repeater segments, 10BASE-FL for connecting to a terminal and others. 10BASE-T /optical media converter repeater is used for preventing electrical noise, extending cable length and other applications.

MII connector (Male)   RJ45 (Female)
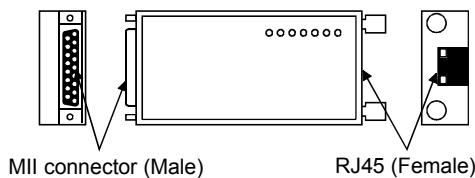
Appendix 8 Grounding the FL-net (OPCN-2) System

Appendix 8.1 Summary of grounding the FL-net (OPCN-2) system

The following shows the method of grounding the controller control panel for FL-net (OPCN-2) system to iron frames of a building.
Note that certain conditions must be met when grounding a control panel to the iron frames of a building. If those conditions cannot be met, provide a dedicated ground (Type D ground or higher).

(1) The frames are welded together.

(2) There is Type D grounding between the ground and the frames.

(3) Current from the high-voltage circuit shall not flow into the ground contact point for the control panel.

(4) The ground point for the control panel and the ground point for the high-voltage panel shall be separated by more than 15 m.
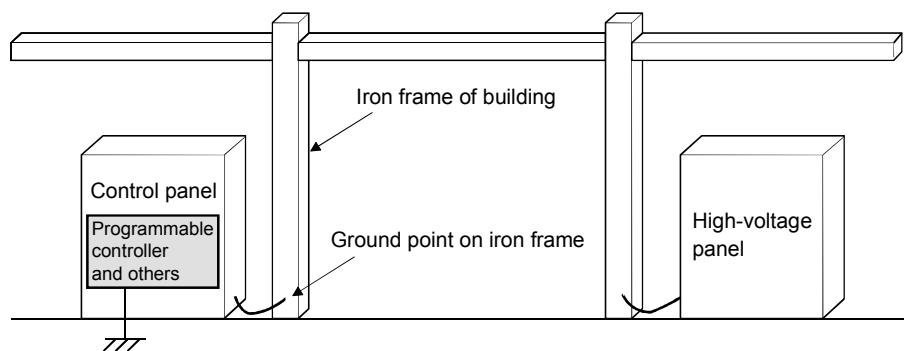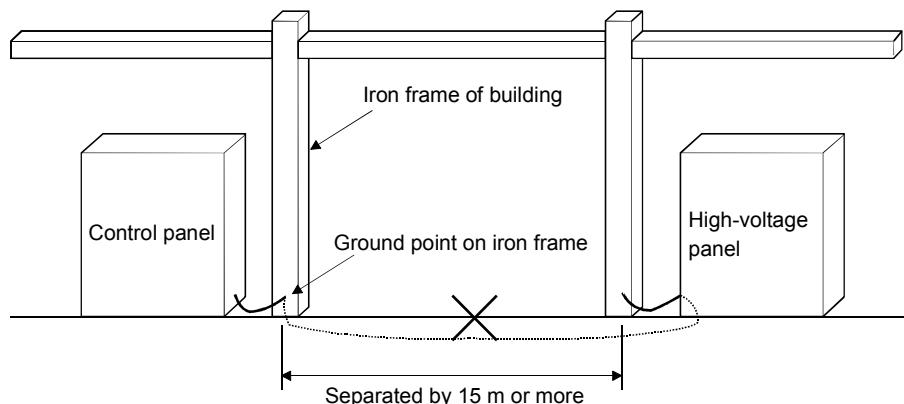
Appendix 8.2 Power supply wires and grounding

The following shows the power supply wiring for the FL-net (OPCN-2) system and the grounding as well and provides an example of the power supply wiring for the panel board and controller panel and the grounding.
Follow the information given below when wiring the power supply and grounding.

(1)   Isolate the circuit between control power supply and controller power supply by an insulated transformer with a static electricity shield.

(2)   Ground the frame for the control panel and the control board for the controller with a Type D ground.

(3)   Do not connect the frame ground (FG) terminal on the controller to the control panel frame. Use a dedicated ground (Type D or better) for the controller.

(4)   Keep the wiring for the input power supply for the controller as short as possible and wire in a twisted configuration.

(5)   Connect the line ground (LG) terminal for the controller to the shielded terminal on the insulated transformer and ground the frame of the panel.
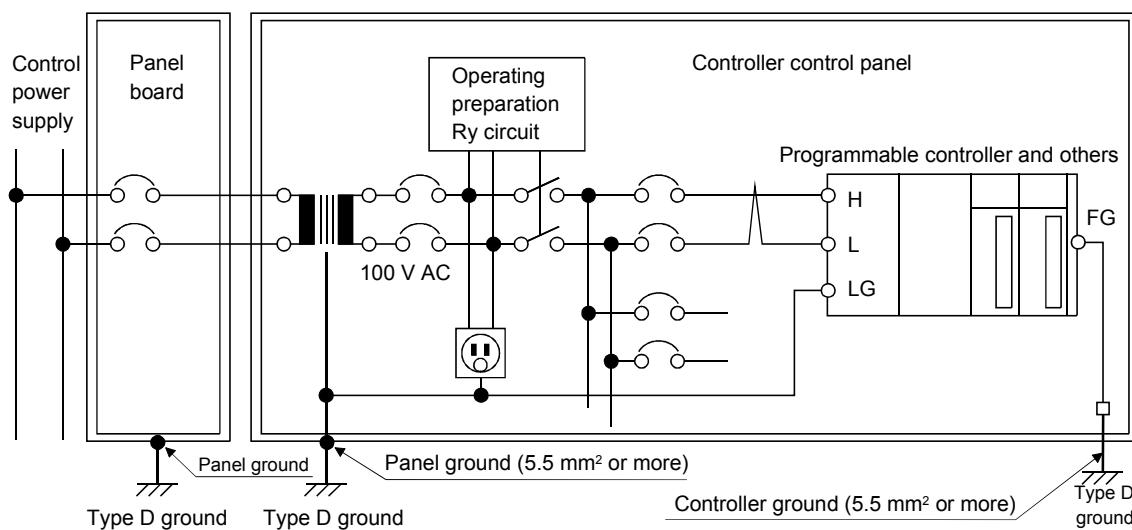
Appendix 8.3 Power supply wiring and grounding for network equipment in the FL-net (OPCN-2) system

The following shows the power supply wiring and grounding for network equipment in the FL-net (OPCN-2) system. Follow the procedure below for examples of the power supply wiring and grounding.

(1) When grounding the coaxial cable, connect it to the dedicated Type D ground for the controller.

(2) The frame ground for the HUB for 10BASE-T/100BASE-TX is connected to the dedicated Type D ground for the controller. Supply power from an insulated transformer with a static electricity shield as is used for the power supply for the controller.

(3) Do not connect the frame ground (FG) terminal on the controller to the control panel frame. Use a dedicated ground (Type D or better) for the controller.

(4) Connect the frame ground (FG) terminal for the FL-net module to the frame ground (FG) terminal on the controller.

(5) Connect the shielded earth on the transceiver cable (AUI) to the frame ground (FG) on the FL-net module.

(6) If a direct current power supply (such as 12 V DC) is required by the transceiver (AUI), provide a dedicated stabilize power supply module for the network and connect that direct current output to the terminal for the FL-net module. Provide the 100 V AC input power supply from an insulated transformer with a static electricity shield as is used for the controller.
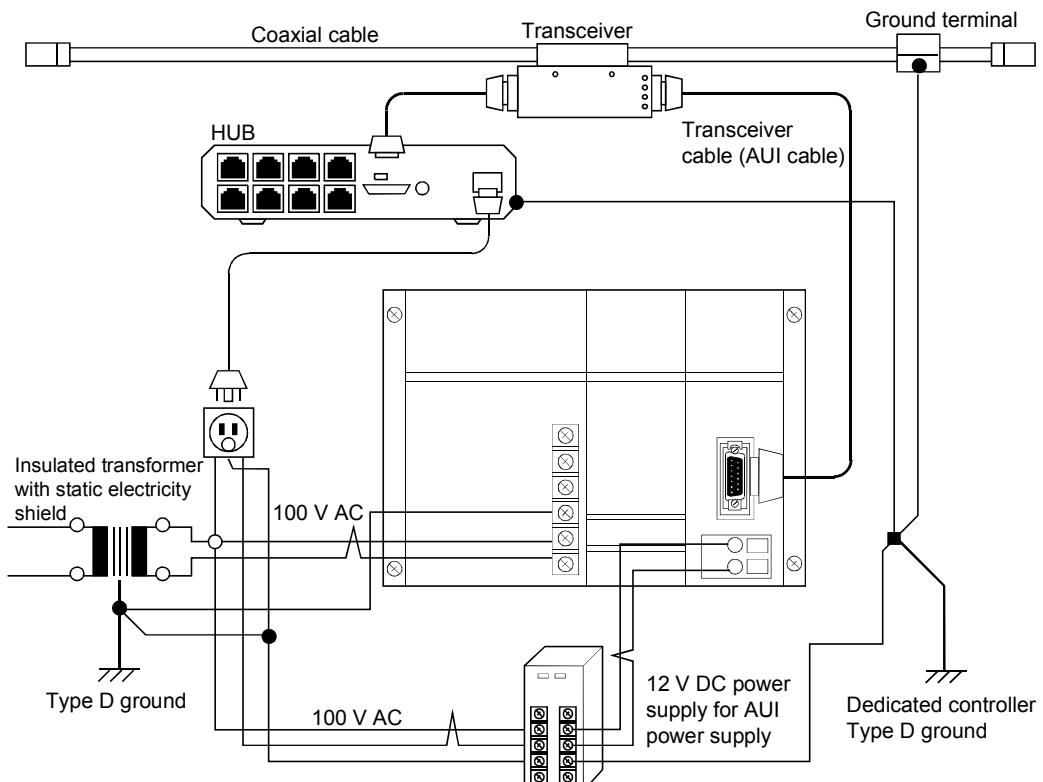
Appendix 8.4 Mounting FL-net (OPCN-2) system network components

The following shows examples for mounting the network components (transceiver, HUB, etc.) to the FL-net (OPCN-2) system.
Follow the procedures below when mounting components.

(1) Mount the transceiver to a wood insulation board inside a steel mounting box. Be sure that the mounting box has a Type D ground.

(2) Route the transceiver cable through electric conduit to the control panel for the controller. Make sure that the conduit has a Type D ground.

(3) Use rubber legs or some other type of electric insulation material with the mounting bracket for the HUB. Use a metal U-shaped mounting bracket to connect it to the control panel for the controller. Make sure that the mounting bracket for HUB should be grounded to the control panel for the controller and it has a Type D ground.
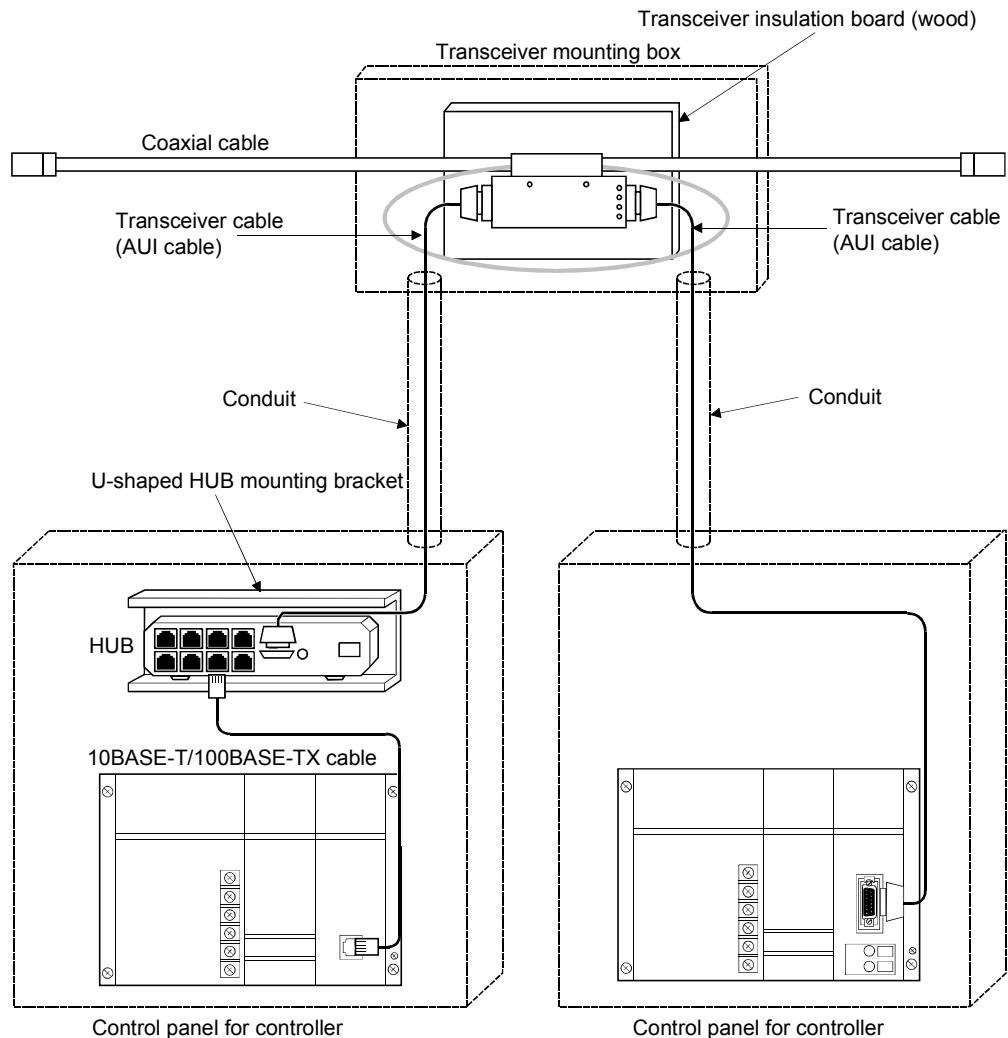
Appendix 8.5 Wiring grounding wiring ducts and conduit

The following shows the grounding of wiring ducts for the FL-net (OPCN-2) system and the wiring and grounding of conduit.
Follow the procedure below for routing the wiring.

(1)   If a wiring duct is used for routing the wires, use separators to separate the power wires and signal wires according to their levels. Make sure that the wiring duct (including the cover and separators) has a Type D ground.

(2)   If conduit is used for routing the wires, prepare separate conduit according to the levels of the power and signal wires. Always use conduit meeting JIS-C-8305 specifications and ground with Type D ground.

Separator

Communication cable

Analog input/output wire

Input/output signal wire

Signal cable

Wiring duct

Type D insulation

Signal cable

Conduit

Type D insulation
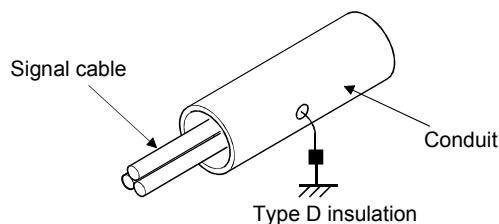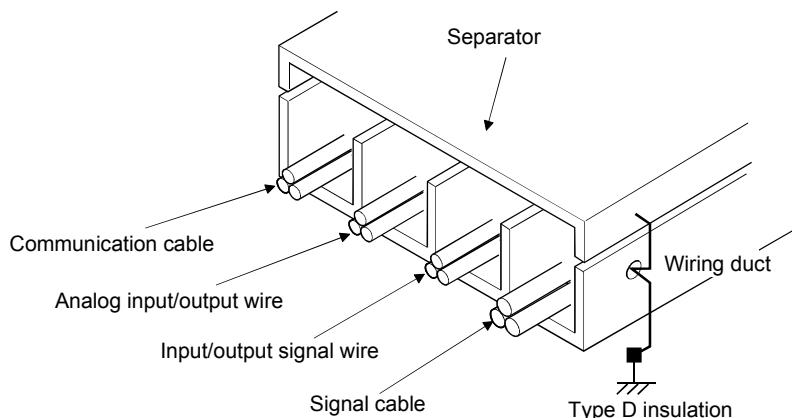
Appendix 9 FL-net (OPCN-2) Installation Checklist

FL-net (OPCN-2) installation checklist				
Communication line name:		Node no:		
			Inspection data		
Check item		Inspector Company Name		
Cables	Are all connectors securely locked?			
	Are the bend diameter of the cables the established value or greater?			
	Are the connectors protected by jackets, etc.?			
	Have the wires been identified by wire numbers? Are they correct?			
	Are there any heavy objects on the communication cables?			
	Are the communication cables bundled together with other cables, such as the power cables?			
	Is the length of the AUI cable for the repeater less than 2 m? Is the cable for the transceiver less than 50 m?			
	Is the length of the coaxial cable (10BASE5) less than 500 m?			
	Is the coaxial cable properly grounded?			
	Are the shields for the coaxial cable and the transceiver insulated?			
	Are the correct terminal resistor at the ends of the coaxial cable?			
	Is the number of HUBs or repeaters within the specified number?			
	Is the twisted pair cable using a straight cable?			
	Is the twisted pair cable Category 5 and is its length less than 100 m?			
Units	Is the ground terminal on the equipment properly connected?			
	Is each module tightly secured to its base?			
	Is the base unit tightly secured to the control board?			
	Are the AUI cables securely locked?			
	Is excessive force being applied to any of the cable mountings, such as by a door?			
Hubs, etc.	Is the RJ45 connector securely mounted?			
	Are the AUI cable connectors locked?			
	Are the cables marked with wire numbers?			
	Has the transceiver been properly mounted to the marked location?			
	Has the transceiver SQE switch been properly set according to the equipment specifications?			
	Is the HUB tightly secured?			
	Is the HUB/MAU switch for the hub properly set?			
	Is the specified electrical voltage being supplied to the HUB?			

• Fill in and check this list anytime a modification, change or inspection is made.
• Mark as follows: OK = ○, No good = ✕. For the setting switch column, fill in the rotary switch number. For DIP switches, fill in ON or OFF.

Appendix 10 Profile Supplement

(1) ASN.1 transmission syntax format summary

This section summarizes the portions of this specification manual that is related to ISO/IEC 8825 ASN.1 (Abstract Syntax Notation One) basic coding rules.

(a) Primitive ASN.1 type

Type	Length	Value

(b) Example of structure type ASN.1 type coding

Type	Length	Value						
		Type	Length	Value		Type	Length	Value

(c) Type field

1) Structured (1 Octet type)

Structure type flag : 0 : Primitive type
                      1 : Constructed type

C	C	F	T	T	T	T
8	7	6	5	4	3	2	1

← Tag number

Tag class : 00 UNIVERSAL TAG
            01 APPLICATION TAG
            10 CONTEXT-SPECIFIC TAG
            11 PRIVATE TAG
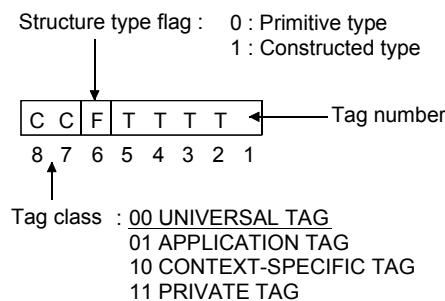
2) Tag number (UNIVERSAL TAG)

Tag number (Hexadecimal)	Type	Tag number (Hexadecimal)	Type
00	(Reserved)	11	SET & SET OF
01	BOOLEAN	12	NumericString
02	INTEGER	13	PrintableString
03	BIT STRING	14	TeletexString
04	OCTET STRING	15	VideotexString
05	NULL	16	IA5String
06	OBJECT IDENTIFIER	17	UTCTime
07	ObjectDescriptor	18	GeneralizedTime
08	EXTERNAL	19	GraphicString
09	REAL	1A	VisibleString
0A	ENUMERATED	1B	GeneralString
0B to 0F	(Reserved)	1C	CharacterString
10	SEQUENCE & SEQUENCE OF	1D to 1E	(Reserved)

3) Each data type and structure type flag

ASN. 1 type	Primitive ($*^1$)	Constructed ($*^1$)
BOOLEAN, INTEGER, OBJECT IDENTIFIER, REAL, ENUMERATED	○	—
BIT STRING	○	○
OCTET STRING, NumericString,etc. structured type	○	○
Null (No value field)	○	—
SEQUENCE, SEQUENCE OF, SET, SET OF	—	○
EXTERNAL	—	○
CHOICE	○	○
ANY	○	○
Tagged type	○	○

$*1$ ○ is compatible

4) Printable string

Name	Character	Code (Hexadecimal)
Capital letters	A, B, ···, Z	41, 42, ···, 5A
Small letters	a, b, ···, z	61, 62, ···, 7A
Digits	0, 1, ···, 9	30, 31, ···, 39
Space	(space)	20
Apostrophe	'	27
Left Parenthesis	(	28
Right Parenthesis	)	29
Plus sign	+	2B
Comma	,	2C
Hyphen	-	2D
Full stop	.	2E
Solidus	/	2F
Colon	:	3A
Equal sign	=	3D
Question mark	?	3F

(d) Length field

1) Fixed length short format

Length : 1 to 127
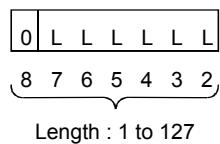
2) Fixed length long format

Octet number showing length : 1 to   Length
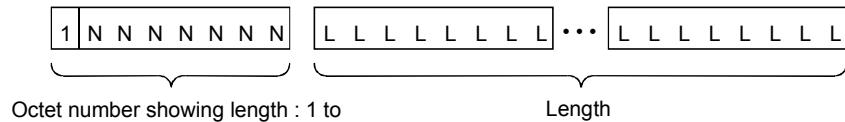
3) Data transmission sequence
The data transmission is the big endian type in which the data with the highest octet to be sent first.

4) Profile reference materials
• Ohgane Hisao, "TCP/IP and OSI Network Management", 1993, Soft Research Center, LTD
• ISO/IEC 8824 Information technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN. 1), 1990 Second edition, (IS/IEC 8824-1 1995, ISO/IEC 8824-2 1995, ISO/IEC 8824-3 1995, ISO/IEC 8824-4 1995)
• ISO/IEC 8825 Information technology – Open Systems Interconnection – Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN. 1), 1990 Second edition, (ISO/IEC 8825-1 1995, ISO/IEC 8825-2 1996)

(2) Mounting of items that have been read by log data read service
Declaration of mounting/not mounting of the items that have been read by log data read service. (○: Mounting / ×: Not mounting)

Item	Description	Status
Send/receive	Totaling socket section send count	○
	Totaling socket section send errors count	○
	Ethernet send error count	○
	Totaling socket receive count	○
	Totaling socket receive error count	○
	Ethernet receive error count	○
Frame types	Token send count	○
	Cyclic frame send count	○
	1:1 message frame send count	○
	1:n message send count	○
	Token receive count	○
	Cyclic frame receive count	○
	1:1 message frame receive count	○
	1:n message receive count	○
Cyclic transmissions	Cyclic transmission/receive count	○
	Cyclic address size error count	○
	Cyclic CBN error count	○
	Cyclic TBN error count	○
	Cyclic BSIZE error count	○
Message transmissions	Message transmission re-send count	○
	Message transmission re-send over count	○
	Message transmission /receive error count	○
	Message transmission serial number count	○
	Message transmission re-send confirmation count	○
ACK related	ACK error count	○
	Serial number version error count	○
	Serial number error count	○
	Node number error count	○
	TCD error count	○
Token related	Token multiplexing recognition count	○
	Token destroyed count	○
	Token reissues count	○
	Token holding time count	○
	Token monitoring time out count	○

Item	Description	Status
Status 1	Total operating time	○
	Frame wait status count	○
	Entry count	○
	Self- release count	○
	Release by skip count	○
	Other node release recognition count	○
Status 2	Participation recognition node list	○

Appendix 11 Programming for Use of FL-net Module on MELSECNET/H Remote I/O Station

When using the FL-net module on the MELSECNET/H remote I/O station, take into account the following for programming.
This section provides the precautions for reading/writing buffer memory data of the FL-net module using the REMFR/REMTO instruction in programs for initial processing, cyclic transmission, message transmission, etc.
Refer to Section 6.5 for programs for initial processing, cyclic transmission and message transmission.

(1) REMFR/REMTO instruction

(a) Make programming so that the next instruction is executed after completion of the REMFR/REMTO instruction execution.
Several scans are required from when the REMFR/REMTO instruction is executed until read/write of the actual data is completed.
Whether the REMFR/REMTO instruction is completed or not can be checked by the completion device.

(b) When reading/writing data larger than 960 words, execute the REMFR/REMTO instruction several times.
In that case, make programming to provide a handshake for exclusive processing.
Note that one REMFR/REMTO instruction is executed once (read/write of up to 960 words) for the same module.

(2) REMFR/REMTO instruction and output signal Y
When turning ON/OFF the output signal Y after completion of the read/ write of data by the REMFR/REMTO instruction from/to the FL-net module buffer memory, take into account the following for programming.

(a) When turning ON output signal Y
Before turning ON the output signal Y, make sure that the completion device is ON after execution of the REMFR/REMTO instruction.

(b) When turning OFF output signal Y after turning it ON
Before turning OFF the output signal Y, make sure that the input signal X corresponding to the output signal Y is ON (X2 is OFF for message reception).
Refer to Section 3.2.4 for details of the I/O signals.

1) Message transmission example

Sequence program

Execution of REMTO instruction — Data transfer

REMTO instruction completion device

(a)

Y0
Massage transmission request

(b)

X0/X1
Message transmission normal/ abnormal completion signal

Line

Massage data   ACK
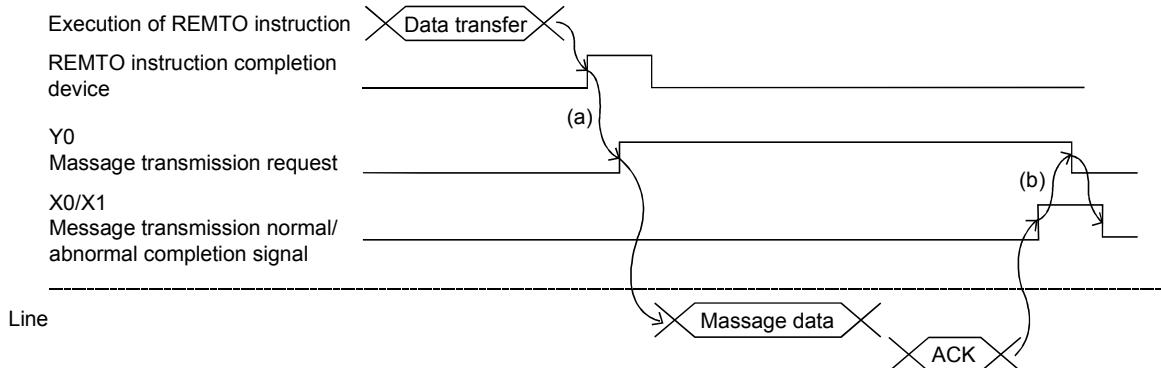
2) Message reception example

Line

Massage data   ACK

Y2
Message receive completion confirmation

(b)

X2
Receiving message signal

(a)

Sequence program

Execution of REMFR instruction — Data transfer

REMFR instruction completion device
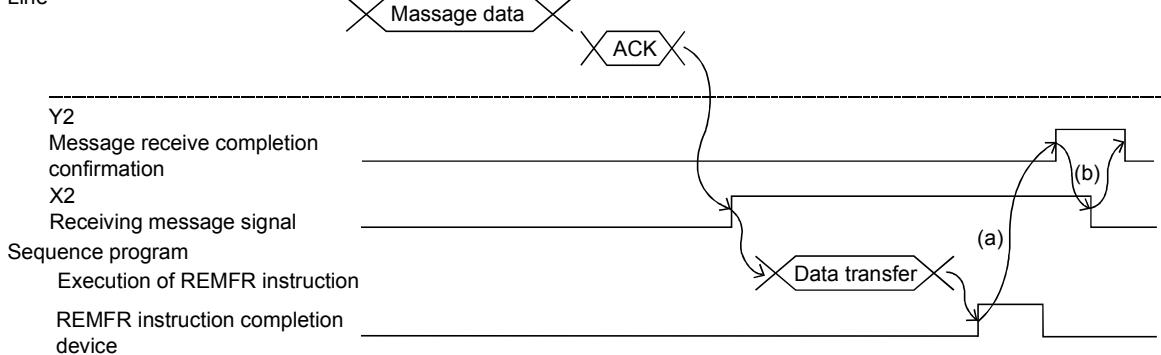
POINT

For details of the REMFR/REMTO instruction, refer to "Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O Network)".

Appendix 12 Cyclic Data Area Assignment Sheet

(1) Area1 (bit area)

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 01FFH)	Buffer memory address (1C00 to 1DFFH)	Data size (Word units)	Buffer offset	PLC side device	
☐☐1						
☐☐2						
☐☐3						
☐☐4						
☐☐5						
☐☐6						
☐☐7						
☐☐8						
☐☐9						
☐☐0						
(example) ☐☐1	0000 to 000FH	1C00 to 1C0FH	16	0	B0 to BFF	
☐☐3	0020 to 002FH	1C20 to 1C2FH	16	32	B200 to B2FF	Local node

(2) Area2 (word area)

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 1FFFH)	Buffer memory address (2000 to 3FFFH)	Data size (Word units)	Buffer offset	PLC side device	
☐☐1						
☐☐2						
☐☐3						
☐☐4						
☐☐5						
☐☐6						
☐☐7						
☐☐8						
☐☐9						
☐☐0						
(example) ☐☐1	0000 to 00FFH	2000 to 20FFH	256	0	W0 to WFF	
☐☐3	0200 to 02FFH	2200 to 22FFH	256	512	W200 to W2FF	Local node

Appendix 13 External Dimensions

(1) QJ71FL71-T-F01, QJ71FL71-T

The appearance of the QJ71FL71-T is the same as that of the QJ71FL71-T-F01, except the model name part and silkscreen print. (Refer to Section 3.6.)

98

90

4

R1
(*1)

QJ71FL71-T-F01
RUN PER
LNK 100M
TX RX

10BASE-T/100BASE-TX

(*2)

QJ71FL71-T-F01

23
27.4

(Unit: mm)
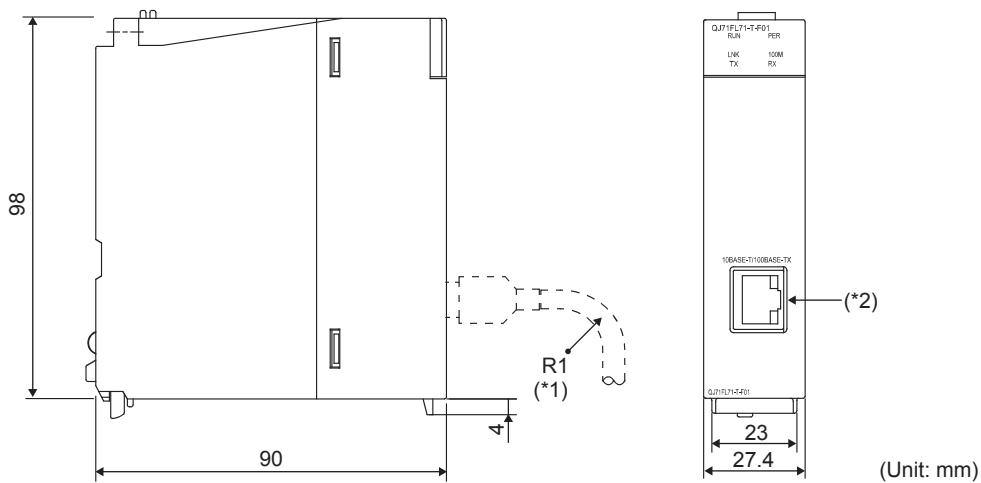
*1 When connecting a twisted pair cable, the bending radius near the connector (reference value: R1) must be four times the cable's outside diameter or larger.

*2 The orientation of the connector is different (rotated) depending on the serial No.

(2) QJ71FL71-B5-F01, QJ71FL71-B5

The appearance of the QJ71FL71-B5 is the same as that of the QJ71FL71-B5-F01, except the model name part and silkscreen print. (Refer to Section 3.6.)

98

90

8.5

4

R2
(*3)

DC powersupply fortransceiver

QJ71FL71-B5-F01
RUN PER
LNK
TX RX

10BASE 5

+12
12G

12V

EXT.PW

QJ71FL71-B5-F01

23
27.4

(Unit: mm)
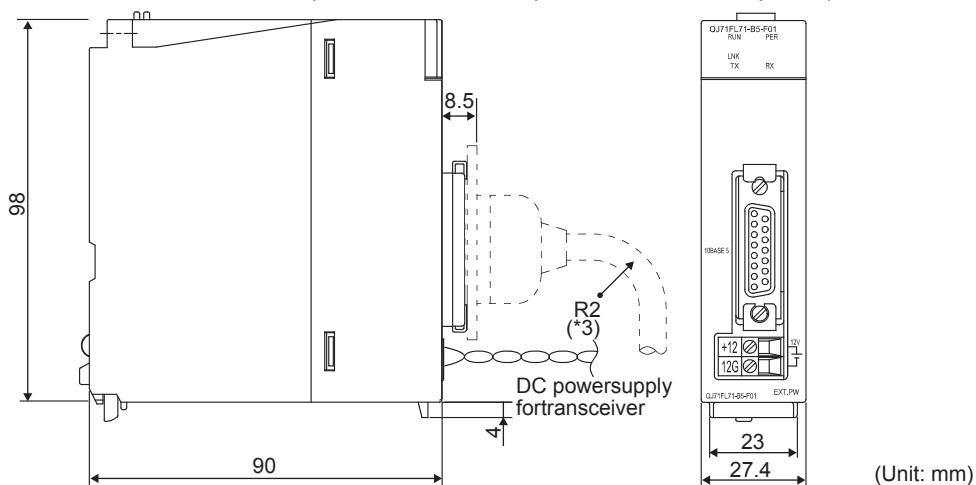
*3 When connecting a AUI cable, the bending radius near the connector (reference value: R2) must be four times the cable's outside diameter or larger.

(3) QJ71FL71-B2-F01, QJ71FL71-B2
     The appearance of the QJ71FL71-B2 is the same as that of the QJ71FL71-B2-
     F01, except the model name part and silkscreen print. (Refer to Section 3.6.)

(Unit: mm)

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[1]

WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

<u>SH-080350E-K(1207)MEE</u>
MODEL: QJFL71-F01-U-SY-E
MODEL CODE: 13JR61

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When exported from Japan, this manual does not require application to the
Ministry of Economy, Trade and Industry for service transaction permission.

Specifications subject to change without notice.